TYPE H-9W PLUG-IN UNIT

IWATSU

IWATSU ELECTRIC CO., LTD.

INSTRUCTION MANUAL

TYPE H-9W PLUG-IN UNIT

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CHAPTER 1 GENERAL

The IWATSU Type H-9W horizontal plug-in unit is used in conjunction with the IWATSU Type V-9B, Type V-9C, Type V-9E, or Type V-9F vertical plug-in units to display measuring waveforms on the IWATSU Type SAS-5009B Samproscope. The horizontal plug-in unit is capable of low frequency signal displays in REAL TIME SWEEP and DELAYING SWEEP in addition to the functions of the Types H-9Z and H-9Y. Moreover, it contains an automatic trigger and it has trigger frequency range of from DC to 18GHz which makes it applicable for a wide band range of measurements by one control knob. This instruction manual covers the specifications and operation of the Type H-9W. Thoroughly read this instruction manual before using the unit.

1.1 Specifications

1.1.1 Trigger Source

Internal (DC, positive going or negative going slope: AC, positive going or negative going slope)

External (DC, positive going or negative going slope: AC, positive going or negative going slope: HF)

1.1.2 Trigger Mode and Sensitivity

TRIG MODE	SWEEP	TRIG Note 3)	FREQUENCY	SENSITIVITY	SOURCE
DC + or -	MAIN (including REAL TIME) and DELAYING	MANUAL	DC - 5MHz	30mVp-p or greater sinewave	INT (note 2) and EXT
AC + or - (NORM or HIGH)	MAIN (excluding REAL TIME) and DELAYING	MANUAL	50Hz - 1GHz	More than 5mVp-p pulses with rise time of 30nSec or less	INT and EXT (note 2)
		MANUAL, AUTO	5MHz~10MHz	10mVp-p or more sinewave	
			10MHz~100MHz	1mVp-p or more sinewave	
			20MHz~100MHz (AUTO)	ditto	
			100MHz-1GHz	10mVp-p or greater sinewave	

HF	MAIN (excluding REAL TIME) and DELAYING	MANUAL, AUTO	500MHz - 10GHz 500MHz- 5GHz (AUTO)	30mVp-p or more sinewave	HF with SYNG PROBE (only EXT)
		MANUAL	10GHz - 18GHz	60mVp-p or more sinewaves	

Note: 1) REAL TIME SWEEP must be used only with DC mode.

2) When Source is INT, the value is measured at the INT trigger output terminal of the vertical plug-in unit.
For example, when a Type V-9C vertical plug-in unit is used, approximately 1/10 of the vertical signal input amplitude is applied to horizontal unit as the internal trigger signal.

3) AUTO should be used with Type V-9F when a vertical signal input amplitude is more than 300mVp-p.

1.1.3 External Input Impedance

EXT. TRIG. INPUT (BNC receptacle) 50Ω

EXT. HF SYNC INPUT (Used in conjunction with the HF SYNC probe) (APC-7 receptacle) 50Ω

Note: Refer to the description of accessories for the HF SYNC probe.

1.1.4 Dots density (DOTS/CM)

MANUAL 5 to 1000 dots/CM, variable in 8 steps (accuracy - 5%), and last range is TIMED which is controlled 0.7sec/scan to more with Timed Control.

AUTO Approximately 2 times the indicatory value at 50 dots/CM, approximately 10 times at 5 - 20 dots/CM, and the same as with MANUAL at other ranges.

1.1.5 Single Scanning

Return and No Return possible

1.1.6 External scanning

Input impedance — Greater than 10kΩ

Sensitivity — 60mV – 250mV/CM, continuously variable

Voltage — Approximately -1.3V at the right of CRT screen at maximum sensitivity

Approximately -0.6V at the left of CRT screen at maximum sensitivity

1.1.7 Manual Scanning

Possible with manual scan control

1.1.8 Synchronized pulse output (SYNC PULSE OUT) (When used in conjunction with the Type V-9F)

SYNC PULSE MODE / Measurements	NORM (Sweep time-5nS – 10ps/CM)	DELAYED (5nS/CM for both MAIN SWEEP TIME and DELAYING SWEEP TIME)
Amplitude (Under 50Ω load)	3Vp-p or more negative pulse	2Vp-p or more negative pulse
Repetition	Same as sampling frequency	Same as sampling frequency
Time (Time between the rising point of the pulse and the start of the display on the tube screen when MAIN SWEEP DELAY is minimum.)	Approximately 15nS before the start	Approximately 7nS before the start
Rising time	Approximately 10nS	Approximately 10nS
Receptacle	BNC	

Note: The synchronized pulse output for "DELAYED" is measured, when SWEEP is set to MAIN DELAYED and DELAY POSITION and MAIN SWEEP DELAY are set fully counter-clockwise.

1.1.9 Horizontal Output (HORIZONTAL OUT)

Amplitude	Approximately 1.7V (full scale)
Output impedance	Approximately 10kΩ

1.1.10 Sweep Time, Calibration Accuracy, Minimum Sweep Delay, Sweep Delay, Jitter, and Sampling Frequency

SWEEP	MAIN SWEEP	DELAYING SWEEP	MAIN DELAYED SWEEP
Sweep time	10, 20, 50, 100, 200, 500 pS/CM 1, 2, 5, 10, 20, 50, 100, 200, 500nS/CM 1, 2, 5, 10, 20, 50, 100, 200, 500 S/CM 1, 2, 5, 10, 20, 50 mS/CM Continuously valiable from 1 to 1/2.5 between 10pS/CM and 100μS/CM Ranges between 200μS/CM and 50mS/CM calibrated REAL SWEEP TIME	5, 10, 20, 50, 100, 200, 500nS/CM 1, 2, 5μS/CM CALIBRATED Note: Ranges between 10μS/CM and 50mS/CM cannot be used	10, 20, 50, 100, 200, 500pS/CM 1, 2, 5, 10, 20, 50, 100, 200, 500nS/CM 1, 2, 5μS/CM
Calibration accuracy	less than 5% between 10pS/CM and 100μS/CM less than 3% between 200μS/CM and 50mS/CM (REAL SWEEP TIME)	less than 5%	less than 5%
Minimum sweep delay (Type V-9F vertical plug-in unit used and measured when sweep linearity is 5% or less.)	less than 50nS between 10pS/CM and 5nS/CM less than 70nS between 10nS/CM and 50nS/CM Approximately 120nS between 100nS/CM and 500nS/CM	less than 70nS at 5nS/CM MAIN SWEEP TIME/CM and DELAYING SWEEP TIME/CM	
Sampling frequency	Maximum of 100kHz	Maximum of 100kHz	Same to DELAYING SWEEP

SWEEP	MAIN SWEEP	DELAYING SWEEP	MAIN DELAYED SWEEP
Sweep delay	More than 50nS between 10pS/CM and 5nS/CM More than 500nS between 10nS/CM and 50nS/CM More than 5μS between 100nS/CM and 500nS/CM More than 50μS between 1μS/CM and 5μS/CM More than 500μS between 10μS/CM and 50μS/CM More than 1mS at 100μS/CM	Sweep delay is in the range of sweep delay determined by the position of the MAIN SWEEP TIME/CM switch	Sweep delay is in the range of Sweep delay determined by the position of the MAIN SWEEP TIME/CM switch.
Jitter	less than 15pS (excluding DC synchronization)		1/1000 of the sweep time indicated by DELAYING SWEEP TIME/CM

1.1.11 Accessories

HF SYNC PROBE 1

Input impedance -50Ω

Maximum rated input voltage, absolute value, 500mVp-p AC

(Input - APC-7 connector; output - BNC connector)

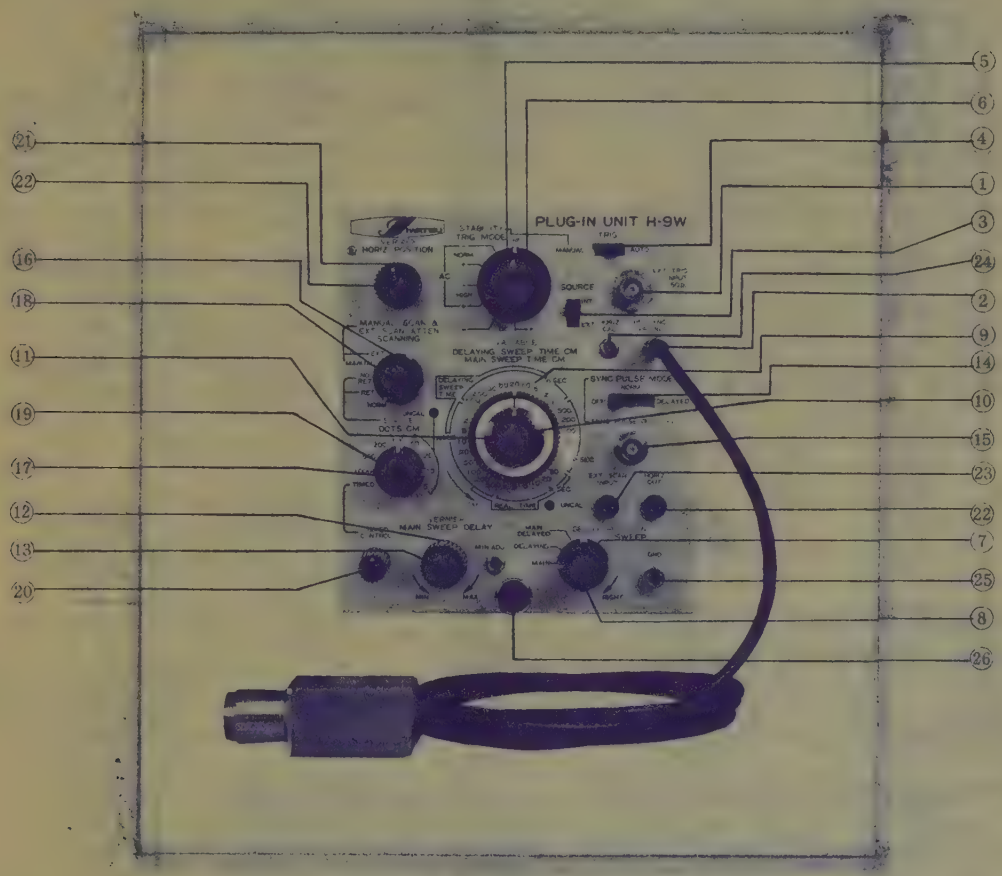
H-F coaxial cable BB-120 1

Conversion connector APC7-NJ 1

Conversion connector NP-BNCJ 1

CHAPTER 2 CONTROLS AND CONNECTIONS

The controls and connections of the IWATSU Type H-9W horizontal plug-in unit are,



(1) EXT. TRIG. INPUT (External Trigger Input Terminal)

The input trigger signal that the frequency is below 1GHz is supplied through this terminal. The input signal voltage should be less than $5V_{p-p}$.

(2) EXT. HF. SYNC. INPUT (High Frequency Trigger Input Terminal)

The accessory HF. SYNC probe is connected to this terminal when the frequency of trigger signal is between 500MHz and 1GHz. Refer to "Accessories" for details of the HF. SYNC probe. The input signal voltage should be less than 0.5V.

(3) SOURCE

Selects Internal or External Triggering. With internal triggering, the vertical plug-in unit should have a triggering signal outlet. When the Type V-9E, Type V-9B, or Type V-9F is used, set the switch to EXT.

(4) TRIG.

Selects automatic or manually triggering. With TRIG. at AUTO, the vertical plug-in unit used should be the Type V-9F which has an automatic triggering signal outlet. When TRIG MODE (5) is set to either Ac or HF with TRIG at AUTO, triggering is automatically established if the measured signal have a frequency of from 20MHz to 5GHz and an amplitude of more than 300mV and are observed for less than 5 cycles in one scan. If it takes long time to synchronize perfectly at AUTO, set the switch to MANUAL.

(5) TRIG MODE

This is used to switch the trigger signals among the following.

HF SYNC This is used for high frequency trigger signals between 500MHz and 18GHz. The accessory HF SYNC probe is connected to the EXT. HF SYNC INPUT terminal.

AC This permits selection of trigger signals between 5MHz and 1GHz. It is set to either (+) or (-). It should also be set to HIGH or NORM depending upon the amplitude of the trigger signals. HIGH provides a sensitivity approximately ten times that of NORM.

DC This is used when the trigger signals are between DC and 5MHz and permits the selection of trigger signals when set to either (+) or (-).

(6) STABILITY

This is used to adjust synchronization and is controlled as follows.

TRIG-MANUAL TRIG MODE-AC

When the knob is rotated from midpoint to fully-clockwise, triggering circuit free runs and a base line is displayed without triggering signal. Setting it counterclockwise a little from midpoint for signals below 20MHz, triggering circuit operates only when trigger signals are applied. If the signal is above 20MHz, synchronization may be obtained under condition of free run range at two or more points.

TRIG-MANUAL TRIG MODE-DC (Real Time Sweep Triggering included)

The center of the trigger level range will exist at about 12 o'clock. Base line is not display without triggering signal.

TRIG-MANUAL TRIG MODE-HF

Triggering circuit free runs overall range. There will be several synchronizing points of knob.

(7) SWEEP (8) and DELAY POSITION

SWEEP is a switch to change sweep modes. It is switched to either DELAYING SWEEP or MAIN DELAYED to observe the rise or fall of a waveform displayed in MAIN operation as shown in Fig. 2.1.

With DELAYING SWEEP set, adjust DELAYING SWEEP TIME/CM (10) and MAIN SWEEP DELAY (12) to points where the desired portion of the waveform appears on the cathode-ray tube screen.

In DELAYING operation the intensified part as shown in Fig.2.2 is controlled by MAIN SWEEP TIME/CM (9) and DELAY POSITION (8) and it indicates the part which is displayed on the tube screen when SWEEP is changed to MAIN DELAYED. The width of the intensified part show the range given in term of MAIN SWEEP TIME/CM. When the DELAY POSITION knob is controlled and then SWEEP is set to MAIN DELAYED, the bright portion of Fig. 2.2 will be expanded as shown in Fig. 2.3.

The sweep time in this case equals that of MAIN SWEEP TIME/CM. The rate of expansion will equal the ratio of DELAYING SWEEP TIME/CM to MAIN SWEEP TIME/CM and should be as small as possible to avoid delay jitter as shown in Fig. 2.4.

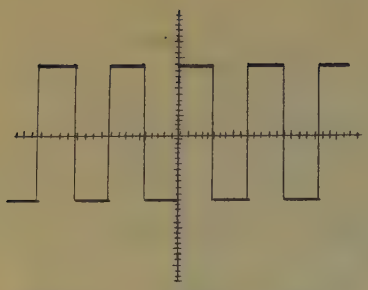


Fig. 2.1 SWEEP - MAIN

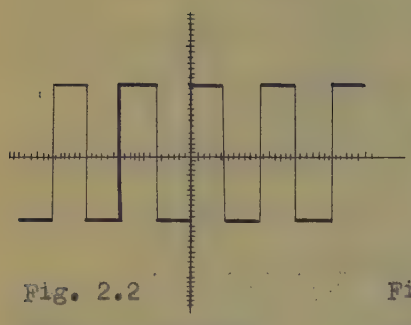


Fig. 2.2
SWEEP - DELAYING

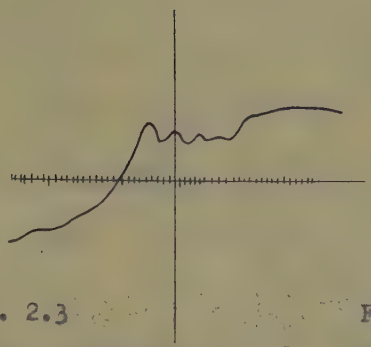


Fig. 2.3
SWEEP - MAIN DELAYED

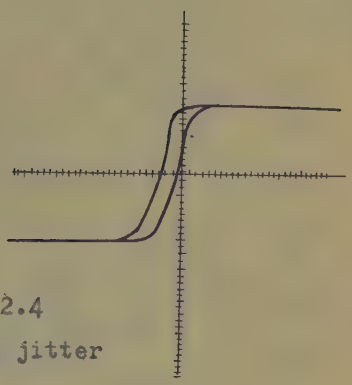


Fig. 2.4
Delay jitter

(9) MAIN SWEEP TIME/CM, (10) DELAYING SWEEP TIME/CM and (11) VARIABLE

These are used to change the sweep time. Sweep time of MAIN SWEEP and MAIN DELAYED SWEEP are expressed in terms of MAIN SWEEP TIME/CM and can be changed in 30 steps between 10pS/CM and 50mS/CM. The 200μS/CM - 50mS/CM ranges is for real time sweep. In these ranges operation is as an ordinary oscilloscope when the TRIG MODE is set to DC. Vertical signals in this case are measured with a chopper mode, DELAYING SWEEP TIME/CM is used to change the sweep time in 10 steps between 5nS/CM and 5μS/CM for DELAYING SWEEP.

Though it can be rotated beyond 5μS/CM counterclockwise, it should not be used at that ranges because indications in this case are not

the true values. DELAYING SWEEP TIME/CM is used to allow selection of any portion of a complex waveform for display at an expanded, faster sweep speed provided by the sweep time of MAIN SWEEP TIME/CM and is mechanically controlled so that it does not exceed the sweep time of MAIN SWEEP TIME/CM.

VARIABLE continuously changes the sweep time of 10pS/CM ~ 100μS/CM ranges of MAIN SWEEP TIME/CM between 1 and 1/2.5 times. When this knob is set to fully counterclockwise position, it turns on for CALIBRATION, and its sweep time is given in terms of MAIN SWEEP TIME/CM. As it is turned clockwise from the CALIBRATED position, the UNCAL neon lamp will light, expanding the sweep time.

(12) MAIN SWEEP DELAY (13) VARIABLE

These permit sweep delay. Its indicate minimum sweep delay at the fully counterclockwise position with the waveform shifting to the right on the tube screen. As it is turned clockwise, the sweep delay increases with the waveform shifting to the left on the tube screen. The sweep delay will vary with the position of MAIN SWEEP TIME/CM regardless of the position of SWEEP. (Refer to "Sweep delay" in CHAPTER 1)

(14) SYNC PULSE MODE (15) SYNC PULSE OUT

When SYNC PULSE MODE is switched from OFF to NORM, negative going pulses synchronized with the sampling pulse appear at the SYNC PULSE OUT terminal and it starts approximately 15nS before the start of the display on the tube screen (when MAIN SWEEP TIME/CM 10pS - 5nS) when MAIN SWEEP DELAY is set to minimum.

When SWEEP is at MAIN DELAYED, the negative going pulse is shifted before the start of the display on the tube screen by the time of sweep delay and delaying sweep.

When the SYNC PULSE MODE switch is set to DELAYED with SWEEP at MAIN DELAYED, the negative pulses rise 7nS before the start of the display on the tube screen (when MAIN SWEEP DELAY is at minimum and MAIN SWEEP TIME between 10pS and 5nS).

(16) SCANNING (17) SINGLE SWEEP

When SCANNING is switched with MAIN SWEEP TIME/CM between 10pS/CM and 100μS/CM, the following operations can be obtained. However, the operation becomes real sweep time mode at 200μS/CM - 50mS/CM of MAIN SWEEP TIME/CM.

NORM — Scanning is performed at the density determined by DOTS/CM (19).

RET — A single scan will be performed every time the SINGLE switch is pushed. The scan rate is determined by DOTS/CM.

NO RET — A single scan is performed only once when the SINGLE switch is pushed; another pushing will cause no more scanning. When another scan is desired, turn the SCANNING switch to RET, and return to NO RET, and push the SINGLE switch. The scan rate at this time is determined by DOTS/CM.

MANUAL — This position permits manual scanning.

(18) MANUAL SCAN AND EXT SCAN ATTEN

when SCANNING is set to MANUAL, this permits positioning the spot at any desired point on the waveform or slowly moving it. With SCANNING at EXT SCAN, it also permits sensitivity adjustment of external signals (sinewave below 10Hz) supplied from EXT SCAN INPUT (23). Its sensitivity range is controlled between 60mV and 250mV/scanning and continuously.

(19) DOTS/CM

Scanning is performed at the densities indicated for each DOTS/CM between 5 and 1000 1, 2, 5 steps. For example, 1000 dots/cm permits the display of a waveform consisting of 1000 dots/cm on the cathode-ray tube screen. At TIMED, the scanning rate is controlled by TIMED CONTROL (20). However, if TRIG is at eitner AUTO, the UNCAL neon lamp will light at 5 - 50 dots/cm, and the value is held at 2 to 10 times the indicated value.

(20) TIMED CONTROL

This permits the continuous cnanging of the scanning rate with DOTS/CM at TIMED.

The maximum scanning speed is approximately 0.7S/scan when set fully clockwise.

(21) HORIZONTAL POSITION (22) VERNIER

This permits the horizontal positioning of the trace. VERNIER is provided for fine positioning adjustment.

(22) HORIZONTAL OUT

This is the horizontal output terminal.

(23) EXT SCAN INPUT

This input terminal is fed the external scanning signals. Scanning start level and sensitivity are following.

Approximately -1.3V scanning start level when sensitivity is maximum. Approximately -0.6V at the left end of the screen when sensitivity is maximum. Approximately -4V scanning start level when sensitivity is minimum.

Approximately -1.5V at the left end of screen when sensitivity is minimum.

(24) HORIZONTAL CAL

This is used to calibrate the sweep time when it differs from the indicated sweep time at all ranges. Use a screwdriver for this adjustment. This calibration may be required when this unit is connected to a different SAS-5009B SAMPROSCOPE. Such a case adjust the HORIZONTAL CAL so that a 10MHz signal is observed as 10 waveforms/ 10cm on the tube screen with MAIN SWEEP TIME/CM at 100nS and MAIN SWEEP DELAY setting to 12 o'clock.

(25) GND

This is the ground terminal.

(26) FIXED KNOB

This should be used to lock the plug-in unit to SAS-5009B SAMPROSCOPE.

CHAPTER 3 MEASUREMENTS

3.1 Precautions

Since the IWATSU Type H-9W horizontal plug-in unit uses a large number of semiconductors and coaxial parts, the following precautions should be observed.

EXT TIRG INPUT

Do not apply voltages greater than 5Vp-p to avoid damaging the resistors and semiconductors.

EXT HF SYNC

This terminal is used to connect the HF SYNC probe. Voltages more than 0.5V must not be applied to it.

EXT SCAN INPUT

Do not apply voltages more than ±10V. Voltages outside in this range will damage the transistors.

Internal inspections

Do not loosen the screws nor disassemble the parts during inspection. Negligence will result in troubles or reduced performance. Printed circuit boards and coaxial connectors should be replaced or positioned in the correct manner. Never attempt to change the setting of the internal controls.

3.2 Basic operation

The Type H-9W IWATSU horizontal plug-in unit cannot be used alone but must be used in conjunction with a vertical plug-in unit (Type V-9F and Type SAS-5009B Samproscope.) (Refer to the Instruction Manual for the basic operation of the Type SAS-5009B Samproscope)

3.3 Measurements

The Type H-9W provides a measuring range wider than that of the conventional Type H-9Z and H-9Y horizontal plug-in unit due to its built-in automatic triggering and delayed sweep mode. Its measuring range is from d-c to 18GHz. Refer to CHAPTER 2 as well as the following.

Selection of vertical plug-in unit

Internal triggering and automatic triggering will be limited as follows depending upon the plug-in unit used in conjunction with this equipment.

Vertical plug-in unit Type V-9C ... Internal triggering possible
Automatic triggering impossible

Type V-9E ... Internal triggering impossible
Automatic triggering impossible

Type V-9B ... Internal triggering impossible
Automatic triggering impossible

Type V-9F ... Internal triggering impossible
Automatic triggering possible

Delayed sweep is possible with any of the vertical plug-in units.

Trigger signal

When the vertical Type V-9C plug-in unit is used, switch SOURCE to INT, at that time it is possible to trace the waveforms without external trigger signals. Type V-9E, Type V-9B, and Type V-9F trigger signals which is synchronized with signals being measured are required.

When the frequency of the trigger signals are between DC and 1GHz, the trigger signals should be connected to EXT TRIG INPUT terminal. To observe low-frequency signals (less than approximately 20MHz), the trigger signal should precede the signal to be measured by the minimum sweep delay

time (refer to CHAPTER 1) so that the rising edge of the waveform can be observed. If signals which are synchronized with the signal to be measured are not available, a part of the measured signal is used as the trigger signal. When the trigger signal is a sinewave having a frequency below 5MHz, TRIG MODE should be set to DC. When MAIN SWEEP TIME/CM is between 200μS/CM and 50mS/CM, the equipment will operates as an ordinary oscilloscope and TRID MODE cannot be used other mode.

When the trigger signal has a frequency between 500MHz and 18GHz, the output of the accessory HF SYNC probe is connected to the EXT HF SYNC INPUT terminal.

An internal pulse having a magnitude of approximately 250mVp-p and frequency of approximately 100MHz appear at the HF SYNC PROBE input connector. This leakage may be superimposed on the measured signal if the trigger signal is not separate from the measured signal. To avoid this, the A501S1 signal T can conveniently be used to reduce the effect of the leakage to 1/10.

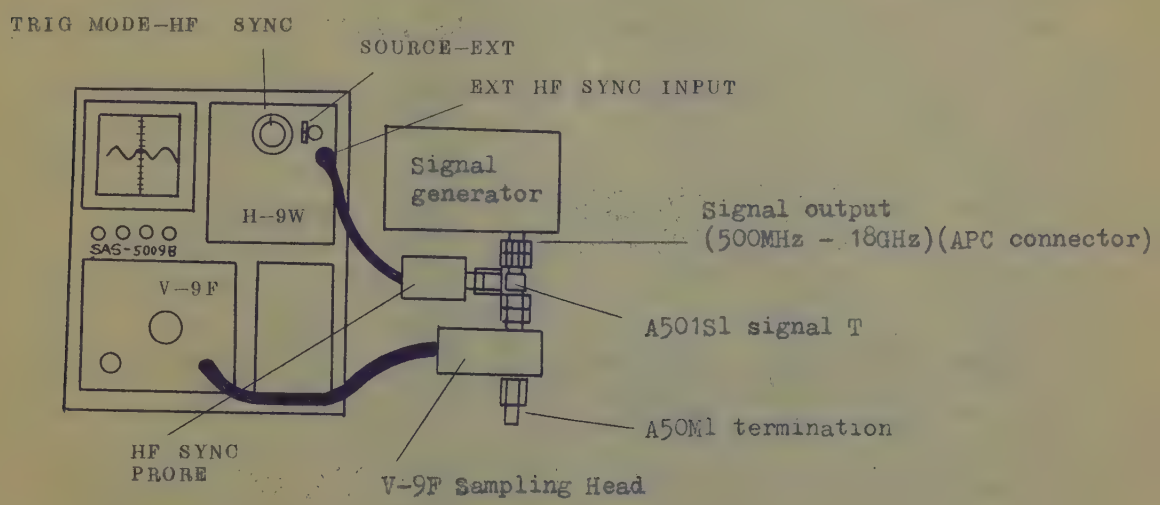


Fig. 3.1 Connection of the HF SYNC triggering signal

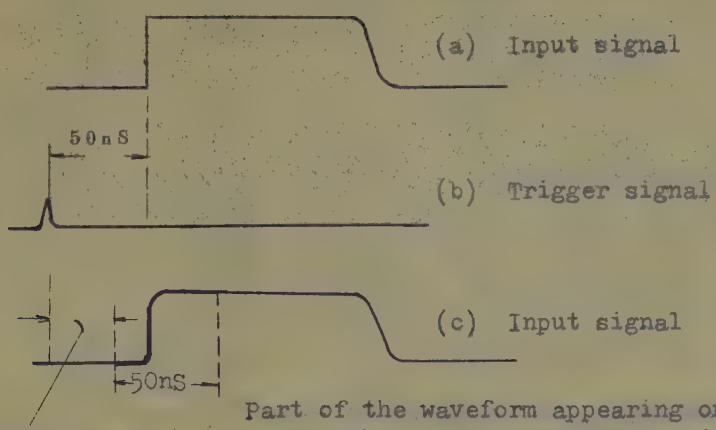
How to use Sync Pulse

If it is possible to externally drive the signal being observed, Sync Pulse can be used to facilitate observation.
When triggering circuit free runs with STABILITY turned clockwise, Sync Pulse will rise approximately 15nS before the start of the display (when SYNC PULSE MODE is at NORM, MAIN SWEEP TIME is at 5nS/CM, and Sweep delay is minimum). If the time difference between Sync Pulse applied to the signal source and the observing signal is too short, apply Sync Pulse through a cable of an appropriate length to obtain a necessary delay. Sync Pulse is positioned approximately 7nS (with MAIN SWEEP DELAY at minimum and MAIN SWEEP TIME at 5nS/CM) before the start of the display when SWEEP is at MAIN DELAYED, and SYNC PULSE MODE is at DELAYED.

How to use Sweep Delay and Delaying Sweep

The use of Sweep Delay and Delaying Sweep will be described together with their meanings. Sweep Delay is determined by MAIN SWEEP TIME/CM as described in the Sweep Delay section of CHAPTER 1. This has the following significance when, for example, pulse waveforms having low repetition rates (below 20MHz) are observed at 5nS of MAIN SWEEP TIME/CM.

Fig. 3.2



Part of the waveform appearing on the tube screen when MAIN SWEEP DELAY and VERNIER are turned counterclockwise within the range which satisfies 5% sweep time linearity.

As shown in Fig. 3.2, if trigger signal 50nS before the rise of the pulse is applied to EXT TRIG INPUT and when the MAIN SWEEP DELAY and VERNIER are turned counterclockwise within the range which satisfies 5% sweep time linearity, a 50nS interval which is delayed from the trigger signal by minimum sweep delay (50nS or less) appears on the tube screen. As MAIN SWEEP DELAY is turned clockwise, the portion lagging by the time equal to the main sweep delay (more than 50nS) can be observed. To observe the delayed portion of waveforms by means of MAIN SWEEP DELAY operation is called sweep delay.

When SWEEP is set to DELAYING and DELAYING SWEEP TIME/CM to 5nS/CM, MAIN SWEEP DELAY will cover almost the same area of sweep delay as that of MAIN SWEEP. Set MAIN SWEEP DELAY so that any portion which will be displayed at an expanded, faster sweep speed appears on the tube screen and the left edge of the intensified portion agrees with the start of the expanded display. Then select MAIN SWEEP TIME/CM for an appropriate degree of expansion. The intensified portion will vary in accordance with the degree of expansion. When SWEEP is switched to MAIN DELAYED under this condition the intensified portion of DELAYING is expanded to the sweep time indicated at MAIN SWEEP

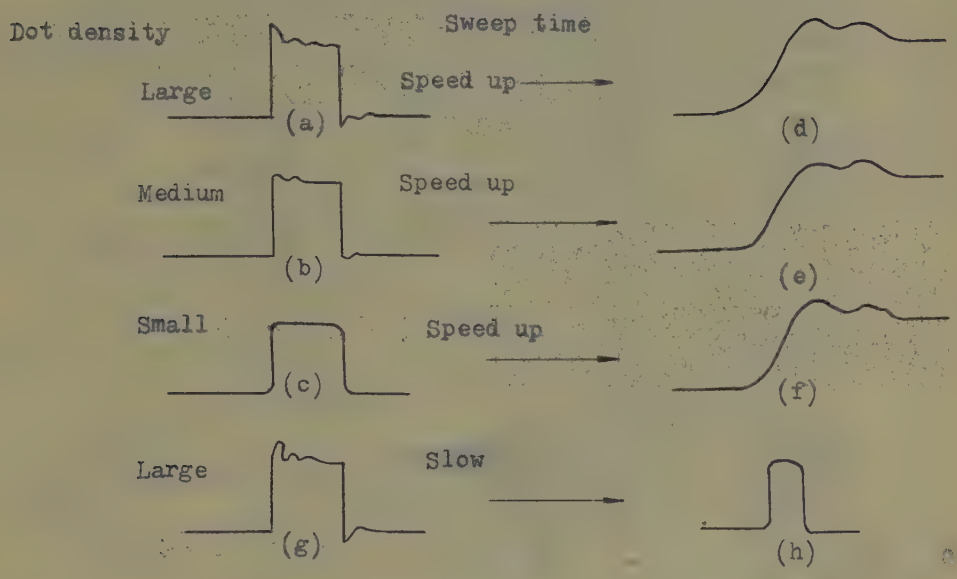
TIME/CM. To observe the delayed portion of waveforms by means of the DELAY POSITION operation is called Delaying Sweep.

Scanning and smoothing

The number of samples taken in any one scan is changed by DOTS/CM. If DOTS/CM is set densely, the sampling density is greater, and hence the faithful reproduction of the signal is displayed on the tube screen. On the other hand, if the sampling density is low, the amount of information will also be small and consequently the waveform on the screen will not be the faithful reproduction of the signal. If this is not understood, erroneous judgement will result. This will be described in the following by referring to Fig. 3.3. The dot density is highest at (a), medium at (b), small at (c), etc. Waveform (a) is a faithful reproduction of the signal, (b) is less faithful around the rise of the waveform because of the comparatively small dot density, and (c) is worse than (b).
Complex waveforms cannot be reproduced faithfully with low dot density. However, if the complex parts of that waveforms become smoothly with sweep time expanded, they can be faithfully displayed on the tube screen as shown in (d) for (a), (e) for (b), and (f) for (c).

Waveform (g) which is reproduced faithfully at a high dot density is reduced to a waveform whose edges are rounded off when the sweep time is made slow as shown at (h). In this case, speed up the sweep time so that the complex parts of the waveforms become smoothly, and the faithful reproduction is displayed on the tube screen.

Fig. 3.3 Dot density and waveform



PARTS LIST (H-9W)

PARTS LIST (H-9W)

Parts Ordering Information

Replacement parts will be available from Iwatsu factory or through Iwatsu representative. Make sure to check the detailed specified value and tolerance in this list before any replacement.

When you place order for replacement, it is requested to furnish us slope model its serial No. ; and relative circuit No. and parts code No.

Abbreviations;

Cer	Ceramic
EPC	Electrolystic paper or metal cased
EPT	Electrolytic paper or metal tubuler
Mp	Metallized paper
Var	Variable
EPT	Electroytic paper or metal tubular
WW	Wire-wound
Prec.	Precision

Note; For a tolerance

Resistors are fixed, ±2% unless otherwise indicated.
Capacitors are ±20% unless otherwise indicated.
All electrolytic capacitors are -10%, +150%.

Manufacture;

NEC:	Nippon Electric Company Limited
Toshiba:	Tokyo Shibaura Electric Co., Ltd.
Hitachi:	Hitachi Ltd.
INSC:	International Semi-conductor
Fairchild:	Fairchild Semi-conductor
NS:	National Semi-conductor Ltd.

(FS-) is a product schematic number in Iwatsu.

Main Frame

Circuit No.	Description			Iwatsu Cord No.
		- Capacitors -		
C117, 118, 418, 701	.001μf	50V	Polyester	741302400
C108, 109, 417, 605 621, 808, 811, 814, 817	.01μf	50V	Polyester	741302430
C413	.022μf	50V	Polyester	741302560
C201, 202, 412, 416	.1μf	50V	Polyester	741302390
C110, 402	47P	500V	Cer	740500540
C415	1000P	500V	Cer	740600180
C414, 801, 803, 805	10000P	500V	Cer	740600340
C404	100P	125V	Polystyrol	741303750
Cr06	220P	125V	Polystyrol	741301730
C610, 620	820Pf	500V	Mica	740904270
Cr01, 403	45P		Cer, Var	741100060
C405, 609, 619	110P		Cer, Var	741100150
C409, 604, 605, 614 615, 622	$1\mu f \pm^{0}_{2}\%$	50V	METALLIZED FILM	741301780
C410, 607, 617, 623	$.1\mu f\ ^{+0}_{-2}\%$	50V	METALLIZED FILM	741301770
C411, 608, 618, 624	$.01\mu f\ ^{+0}_{-2}\%$	50V	METALLIZED FILM	741303510
C102	10000P	25V	BL	740602240
C103, 104, 115, 116	4700P	25V	BL	740602350
C105, 106, 111, 112	1000P	25V	BL	740602250
C601, 611	33 μ	10V	Tantalum	741009100
C602, 612	3.3 μ	10V	Tantalum	741009110
C603, 613	0.33μ	50V	Tantalum	741303520
C102, 809, 815	100 μ	10V	EPT	741003160
C408, 812, 818	33 μ	25V	EPT	741009970
C802	74 μ	350V	EPT	741004630
C804, 806	4.7 μ	160V	EPT	741003870
		- Diodes -		
D201, 401, 402, 701	Silicon	1S953	(NEC)	740401720
D202, 404	Tunnel	IS1760	(NEC)	740402900
D601, 602, 603, 604	Tunnel	IS1198	(NEC)	740402380
		- Jack Connector -		
J110	Coaxial type BNC	BNC-RBZ-9		745002360
J102, 105		BNC-27 (FS-23434)		745003590
J201, 301, 401, 501	For Printed Board	143-022-01		745001070
J103	For Printed Board	143-010-01		745003420

Circuit No.	Description			Iwatsu Cord No.
		- Plug Connector -		
P104, 401, 402, 601 602, 603, 701	14P	N-102P		745002940
P801	24P	26-159-24	(Amphenol)	745000430
		- Resistors -		
R136, 137	47 ohm	1/2W		742410120
R112	51	1/2W		742410130
R613, 669	75	1/2W		742410170
R117, 133, 140, 141 144, 124, 425, 433 612, 668	100	1/2W		742410200
R201, 666	200	1/2W		742410270
R804, 805	300	1/2W		742410310
R435	470	1/2W		742410360
R202	560	1/2W		742410380
R128	820	1/2W		742410420
R207, 210, 405, 432, 801	1 K	1/2W		742410440
R145, 204, 206	2 K	1/2W		742410490
R123, 129	2.4K	1/2W		742410510
R422	3.9K	1/2W		742410560
R203, 426, 434, 702	4.7K	1/2W		742410580
R126, 127, 142, 704	7.5K	1/2W		742410630
R118, 139, 406, 430, 601, 664, 667, 801 804, 805	10 K	1/2W		742410660
R148, 411	15 K	1/2W		742410690
R408, 410, 414	20 K	1/2W		742410720
R423	22 K	1/2W		742410730
R146	24 K	1/2W		742410740
R119, 431	27 K	1/2W		742410750
R135	30 K	1/2W		742410760
R134, 415, 419, 802	47 K	1/2W		742410810
R421	56 K	1/2W		742410830
R436, 611	100 K	1/2W		742410890
R125	150 K	1/2W		742410930
R429	200 K	1/2W		742410960
R412, 413, 427	1 M	1/2W		742411130
R402	2 M	1W		742420990
R116	47	2W		742430110
R106, 107, 108, 109	1 K	1/4W		742530500

Circuit No.	Description			Iwatsu Cord No.
R101, 104	TR1/8W 56 Ω ±5%	(Allen-Bradley)		742610190
R105	TR1/8W 75 Ω ±5%	(")		742610210
R149	TR1/8W 200 Ω ±5%	(")		742610140
R143	TR1/8W 300 Ω ±5%	(")		742610040
R103	TR1/8W 270 Ω ±5%	(")		742610310
R609, 610	10 ohm	1/8W	1%	742110140
R608	30	1/8W	1%	742110150
R607	50	1/8W	1%	742110160
R606	100	1/8W	1%	742110170
R605	300	1/8W	1%	742110180
R604	500	1/8W	1%	742110190
R603, 659, 660	1 K	1/8W	1%	742110200
R602, 658	3 K	1/8W	1%	742110210
R663	20K	1/8W	1%	742110520
R662	50K	1/8W	1%	742110530
R661	100K	1/8W	1%	742110030
R618, 619, 620, 621 622, 623, 624, 625 626, 627, 628, 629	7.50K	1/8W	1%	742110730
R651, 652, 653, 654 655, 656	10.5K	1/8W	1%	742110740
R633, 634, 635, 636 637, 638, 639, 640 641, 642, 643	13.1K	1/8W	1%	742110750
R645, 646, 647 648, 649	15.0K	1/8W	1%	742110760
R632	6.91K	1/8W	1%	742110770
R102, 147	50 Ω	1/4W	1% (FS-20941)	742730530
R122	500 ohm	Var	HF ADJ 2	743220070
R132	1 K	Var	Stability ADJ 2	
R208	1 K	Var	Auto ADJ 1	743220090
R404	1 K	Var	S.D Start ADJ 1	
R205	2K	Var	DC Trig Adj	743220130
R120	5 K	Var	HF Adj 1	743220150
R657	5 K	Var	Ind Stop Adj	
R130	3 K	Var	Stability Adj 1	743220970
R665	10K	Var	Real Sweep Cal	743220190
R420	20K	Var		743220230
R418	50K	Var	M Start Adj 2	743220280
R416	500K	Var	M Start Adj 1	743220350
R401	500K	Var	Timed Control	743222070
R428	5K	Var	H. Gain Adj.	743220180
R121	500+500+500	Var	Stability	743252670
R601	10K (With switch)	Var	ST Var	743252660
R409	30K+100K	Var	Manual Scan	743251270
R703	10K	Var	Delaying Pos. double	743410340

Circuit No.	Description		Iwatsu Cord No.
R403	10K // 10K double	Var H. Position	743251430
R803	10K// 10K double	Var Sweep Delay	743251430

- Switches -

S101	Rotary	Triggering	744316060
S401	Rotary	Dots/CM	744315630
S402	Rotary	Scanning	744315642
S601	Rotary	Sweep Time/CM	744315602
S701	Rotary	Sweep	744315620
S105, 106, 107, 201 202, 301, 404, 405, 406	Relay		744500640
S403	Push	Single Sweep	744400050
S104	Slide	Sync. Pulse Mode	744400180
S103	Slide	Trig	744401570
S102	Coaxial Slide	Source	

- Terminals -

TB403	8ϕ	Ground	745100140
TB401, 402			

- Transistor -

TR101, 102	2SC987	(NEC)	740304860
TR103	2SB250	(NEC)	740300790
TR104, 202	2SA495G-Y	(Toshiba)	740303880
TR106	2SC37	(NEC)	740300890
TR107	2SC640-L	(NEC)	740302870
TR108	2SC154C	(Hitachi)	740304000
TR201	2SC288A	(NEC)	740303930
TR401, 402, 601	2SC183-Q	(NEC)	740302400

TRIGGER CIRCUIT

- Capacitors -

C11	7PF	Var, Cer	741100600
C9, 6	5P	Cer	740503080
C13, 31	22P	Cer	740500490
C5, 20, 21, 28	0.001μF 50V	Polyester	741302400
C27	0.0047μF 50V	Polyester	741302640
C7, 18, 22	0.01 μ 50V	Polyester	741302430
C8	0.047μ 50V	Polyester	741302010

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Circuit No.	Description			Iwatsu Cord No.
C12	0.022 μ	50V	Polyester	741302560
C24, 25	0.1 μ	50V	Polyester	741302390
C15	0.0033 μF	50V	Polyester	741302830
C14, 17, 29	100P		Polystyrol	741303750
C19	10 μ	10V	EPT	741008440
C2, 16	33 μ	10V	EPT	741008230
C3, 26	10 μ	25V	EPT	741003030
C23	1 μ	50V	Metallized	741301860
C1, 4	10000P	25V	BL	740602240
C10	1000P	25V	BL	740602250
		- Diodes -		
D5, 13, 14, 15 16, 19, 20	Silicon	1S953	(NEC)	740401720
D8	Germanium	SD56	(NEC)	740401130
D4	Zener	RD7A-N	(NEC)	740403940
D2	Silicon	1F105	(Fujitsu)	740402950
D17		CD13338	(Continental device)	740403510
D1, 6, 7, 9, 10, 11, 12	Tunnel	1S1760	(NEC)	740402900
D3	Tunnel	1S1762	(NEC)	740402530
D18	Zener	RD5A	(NEC)	740400770
		- Jack Connector -		
J1, 2		27-9	(Amphenol)	745002800
		- Inductance -		
L1			(FS22780)	744002970
		- Resistors -		
R4, 14, 16, 34, 42, 66	100 ohm	1/2W		742410200
R60	200	1/2W		742410270
R3, 7, 11, 41	300	1/2W		742410310
R61	360	1/2W		742410330
R9, 26, 27, 39 46, 50	470	1/2W		742410360
R15	820	1/2W		742410420
R19, 23, 24, 33, 47	1 K	1/2W		742410440
R5, 6, 17, 18, 22, 29	2 K	1/2W		742410490
R21, 25	24 K	1/2W		742410510
R36	3 K	1/2W		742410530
R2, 10, 13, 30, 35 48, 63, 65	4.7K	1/2W		742410580

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Circuit No.	Description		Iwatsu Cord No.
R40	5.6K	1/2W	742410600
R31, 38, 51, 54 56, 58, 64	10 K	1/2W	742410660
R43, 49, 53, 55	20 K	1/2W	742410720
R8	27 K	1/2W	742410750
R62	30 K		742410760
R12, 44, 45, 52, 59	47 K	1/2W	742410810
R35	100 K	1/2W	742410890
R32	300 K	1/2W	742411000
R1		1/4W 50 1%	742730530
R28	100 ohm	Var Trig Level Adj	743491400

- Transistors -

TR15, 16, 17	2SC183-Q	(NEC)	740302400
TR3	2SC288A	(NEC)	740303930
TR10, 13, 14	2SC640-L	(NEC)	740302870
TR4, 5, 6, 7, 9, 18, 19	2SA495 G-Y	(Toshiba)	740303880
TR11	2SC373G-2	(Toshiba)	740304110
TR8	2SC321	(Hitachi)	740304580
TR1	2SC987	(NEC)	740304860
TR2	2SC253	(NEC)	740301060
TR20	2SC68	(NEC)	740300930
TR12	FET 2SK12-Y	(Toshiba)	740302920

DELAYING PULSE GENERATOR

- Capacitors -

C7, 22	47P	500V	740500540
C13	100P	500V	740500690
C6, 23	20P		741100690
C3, 18	0.001μ	50V	741302400
C2, 10, 24	0.01 μ	50V	741302430
C9	0.047 μF	50V	741302010
C11, 16, 27	0.1 μ	50V	741302390
C1, 8, 17, 21, 29	100P		741301240
C4	10 μ	25V	741003030
C15	0.01 μF		740602240

- Diodes -

D6, 7, 15	Silicon	1S953	(NEC)	740401720
D2, 10	Silicon	1F105	(Fujitsu)	740402950

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Circuit No.	Description		Iwatsu Cord No.
D1, 4, 8, 9, 12	Tunnel	1S1760 (NEC)	740402900
D5, 13	Zener	RD6A (NEC)	740400790
	- Jack Connector -		
J1, 2, 3, 4	27-9	(Amphenol)	745002800
	- Resistors -		
R30	30 ohm	1/2W	742410080
R1, 28, 37	47	1/2W	742410120
R22	51	1/2W	742410130
R3, 24, 26, 34 43, 45	100	1/2W	742410200
R11, 21	200	1/2W	742410270
R9, 12, 39	470	1/2W	742410360
R10	510	1/2W	742410370
R2, 4, 13, 35, 36	1 K	1/2W	742410440
R15, 31,	1.5 K	1/2W	742410460
R18, 33	2 K	1/2W	742410490
R19, 25, 44	4.7K	1/2W	742410580
R17	47 K	1/2W	742410810
R8, 7, 38, 40	10 K	2W	742430570
R39, 46	15K	2W	742430600
R23, 42	12K	2W	742430590
R14	1 K	Var, Real F. Adj	743220090
R16	1 K	Var, D1 Bias Adj	743220090
R32	1 K	Var, D9 Bias Adj	743220090
R20	10K	Var, TR4 Bias Adj	743220190
R6	10K	Var, Norm Sweep Cal.	743260040
R41	10K	Var, Delaying Sweep Cal	743260040
	- Switches -		
S1, 2	Relay	SM12	744500640
	- Transistors -		
TR1, 4, 8, 11		2SA417 (NEC)	740304080
TR5, 12		2SC37 (NEC)	740300890
TR2, 9		2SC68 (NEC)	740300930
TR7		2SC288A (NEC)	740303930
TR6, 13		2SA495GY (Toshiba)	740303880
TR3, 10		2SC373G-2 (Toshiba)	740304870

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Circuit No.	Description			Iwatsu Cord No.

STAIRCASE GENERATOR

- Capacitors -

C1, 7, 8	0.001μ	50V	Polyester	741302400
C9	0.0047μ	50V	Polyester	741302640
C2	0.01 μ	50V	Polyester	741302430
C3, 10	0.1 μ	50V	Polyester	741302390
C4	100P	125V	Polystyrol	741301240
C5	1500P	125V	Polystyrol	741301710
C11	10μ	25V	EPT	741003030
C13	220μ	10V	EPT	741007750
C6	4.7 μ	160V	EPT	741003870
C12	1000P	25V	BL	740602250

- Diodes -

D1, 2, 9, 10	Silicon	1S953	(NEC)	740401720
D6, 8	Germanium	SD104	(NEC)	740401160
D5		CD13338	(Continental device)	740403510
D4	Zener	RD6A	(NEC)	740400790
D7	Zener	RD11A	(NEC)	740400870
D3	Zener	RD35B	(NEC)	740400990

- Resistors -

R4	47 ohm	1/2W	
R26	100	1/2W	742410200
R3, 14, 22	200	1/2W	742410270
R6	470	1/2W	742410360
R1, 7, 34	1 K	1/2W	742410440
R25, 27, 33	2 K	1/2W	742410490
R28, 29	3 K	1/2W	742410530
R13, 16, 21, 32 37, 39, 43	4.7K	1/2W	742410680
R7	5.6K	1/2W	742410600
R2, 15, 23, 24 38, 46	10K	1/2W	742410660
R12, 20	15K	1/2W	742410690
R11, 19	20K	1/2W	742410720
R8	27K	1/2W	742410750
R30, 42	30K	1/2W	742410760
R9, 40, 41	47K	1/2W	742410810
R5	100K	1/2W	742410890
R36	200K	1/2W	742410960
R10	4.7K	1W	742420440

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Circuit No.	Description		Iwatsu Cord No.
R31	30K	1W	742420630
R35	5K	Var Sweep Length Adj	743220170
R18	10K	Var Sweep Delay	743220200

- Trans -

T1		(FS17786)	744720630

- Transistors -

TR6, 8, 10, 11	2SA495 GY	(Toshiba)	740303880
TR1, 12	2SC183-Q	(NEC)	740302400
TR9	2SC943	(NEC)	740304880
TR3, 4	2SC149	(NEC)	740301040
TR5, 7	2SC640-L	(NEC)	740302870
TR2	2SK12-Y	(Toshiba)	740302920

DELAYING INDICATOR & AUTO TRIGGER

- Capacitors -

C3	0.01 μF	50V	Polyester	741302430
C2	100P	150V	Polystyrol	741301240
C8	1 μF	50V	Metallized	741303090

- Diodes -

D1, 3, 5	Silicon	1S953	(NEC)	740401720
D6		CD13338	(Continental Device)	740403510
D7, 8	Zener	RD11A	(NEC)	740400870
D2, 4	Tunnel	1S1760	(NEC)	740402900

- Resistors -

R36, 51, 59	100 ohm	1/2W	742410200
R7, 10, 20, 42, 44	200	1/2W	742410270
R14, 26, 40	1 K	1/2W	742410440
R11, 12, 13, 23, 24 25, 27, 34, 37, 54, 56	2 K	1/2W	742410490
R33	3 K	1/2W	742410530
R1, 3	3.9K	1/2W	742410560
R16, 28, 31, 45, 49, 50 52, 58	4.7K	1/2W	742410580
R6, 8, 17, 19, 22 38, 53	10 K	1/2W	742410660

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Circuit No.	Description			Iwatsu Cord No.
R2, 4	12 K	1/2W		742410670
R29, 39, 41, 43 46, 48	20 K	1/2W		742410670
R30, 32	30 K	1/2W		742410760
R15	100K	1/2W		742410890
R5, 21	5 K,	1/8W	1%	742110240
R9	1 K	Var, Ind. Stop Adj		743220090
R18	1 K	Var, Ind. start Adj		743220090
R47	2 K	Var, Semi Auto Adj		743220130
R35	10K	Var, Gain Adj		743220190
R55	10K	Var, Auto Level Adj		743220190
R57	20K	Var, Ind. Range Adj		743220230

- Transistors -

TR3, 5, 6, 8, 11, 12 13, 15, 17, 23, 26	2SA495G-Y	(Toshiba)	740303880
TR19, 25	2SC183-Q	(NEC)	740302400
TR1, 2, 4, 7, 10, 14 16, 20, 24	2SC640-L	(NEC)	740302870
TR9, 18	2SC468	(Hitachi)	740302560
TR21, 22	2SK12-Y	(Toshiba)	740302920

H. F. SYNC PROBE

- Capacitors -

C113	2.2 μ	3.15V	Tantalum	741200160
C114	10,000P	24V	BL	740602240

- Diode -

D101	Tunnel	V640	(NEC) Special	740403960

- Connector -

J1	APC-7	(Amphenol)	745003370

- Inductance -

L105, 106	(Special)

- Resistor -

R138	50 ohm	1%	(Special)	742710290

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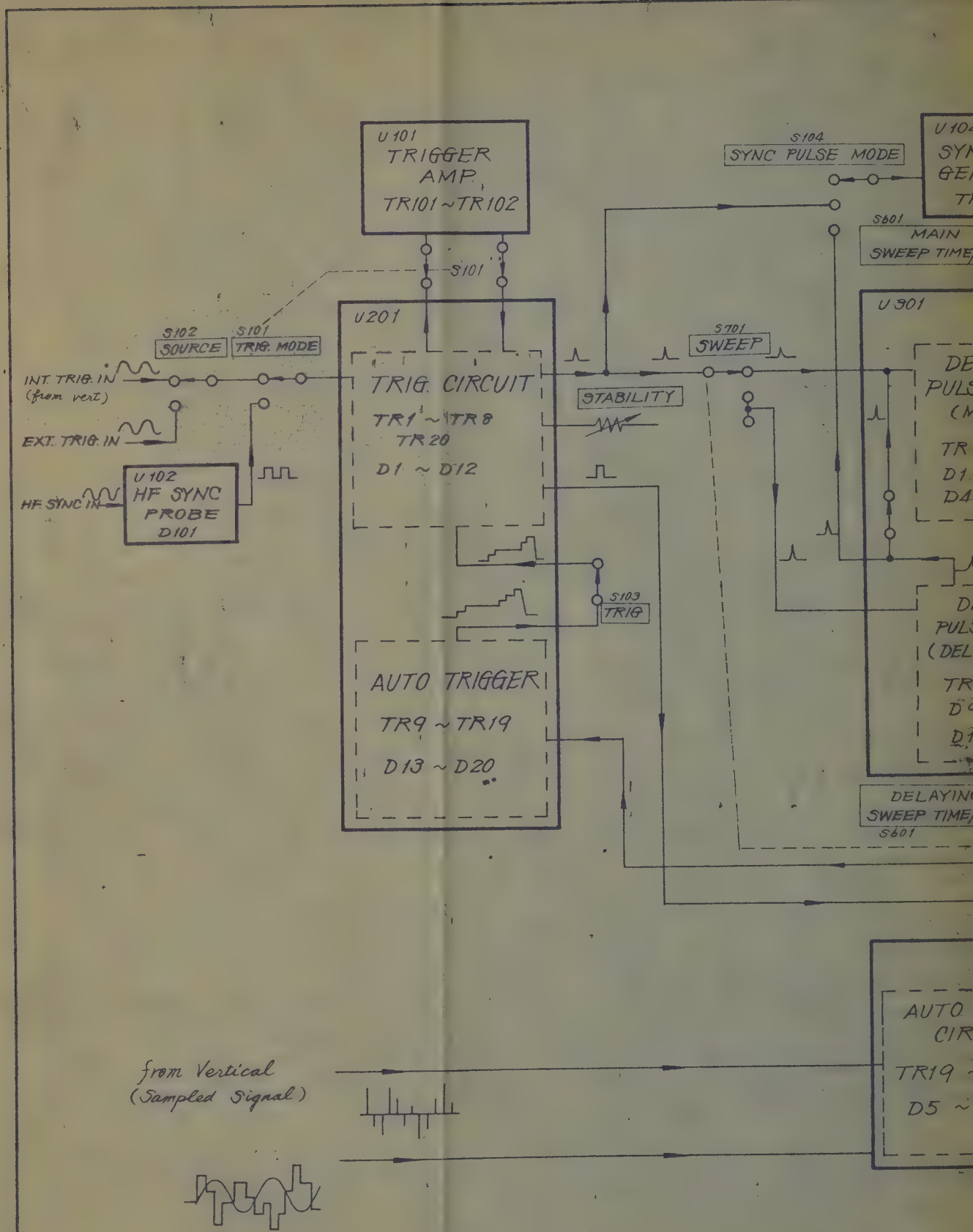
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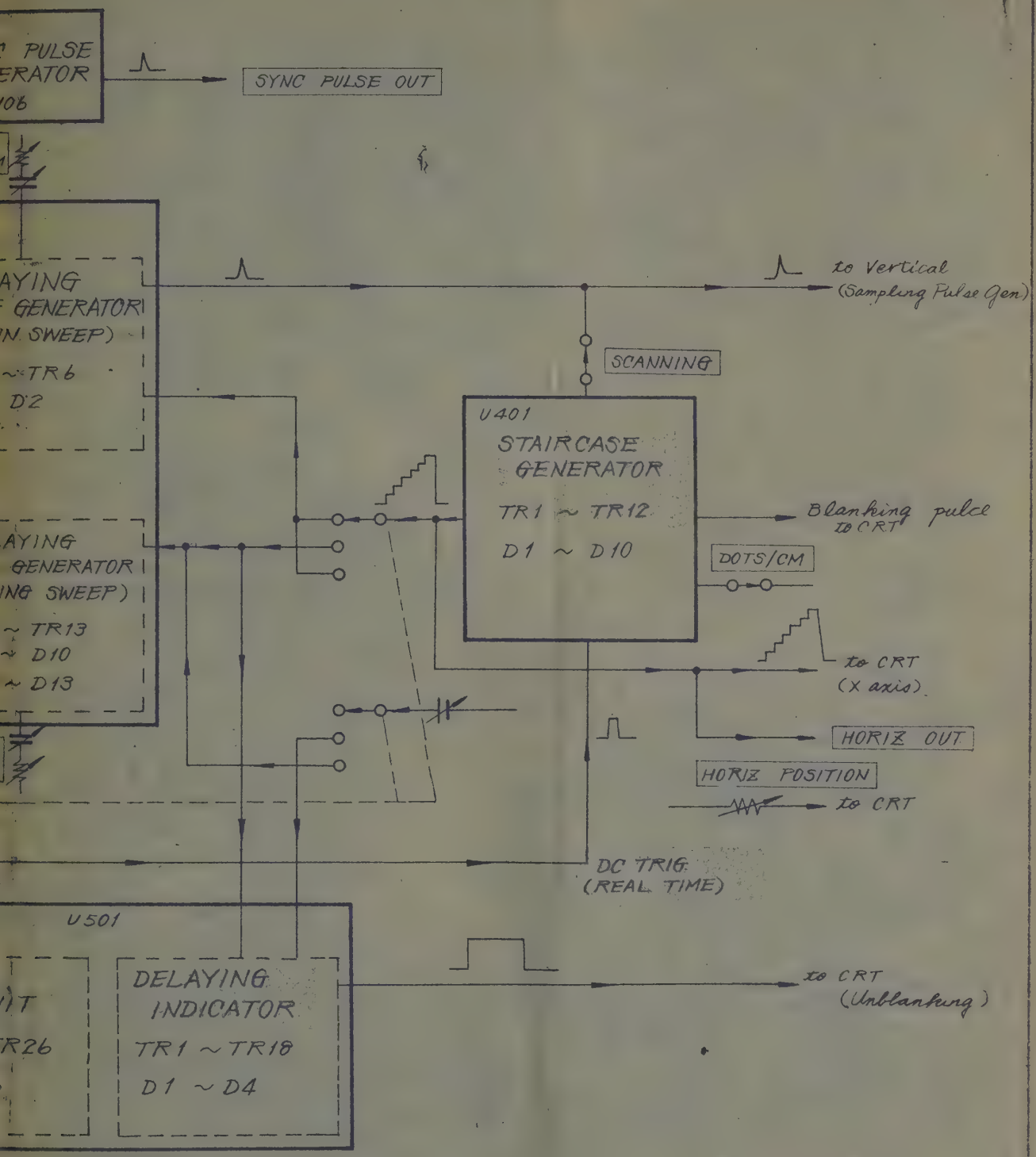
TRIGGER
AMP.
TR101 ~ TR102
S101
S104
SYNC PULSE MODE
S601
MAIN
SWEEP TIME
U201
S102
SOURCE
S101
TRIG. MODE
INT. TRIG. IN
(from vert.)
EXT. TRIG. IN
HF SYNC IN
U 102
HF SYNC
PROBE
D101
TRIG. CIRCUIT
TR1 ~ TR8
TR20
D1 ~ D12
STABILITY
S701
SWEEP
U 301
S103
TRIG
AUTO TRIGGER
TR9 ~ TR19
D13 ~ D20
DELAYING
SWEEP TIME
S601
AUTO
CIR
TR19
D5 ~
from Vertical
(Sampled Signal)



H-9W

BLOCK DIAGRAM

K-604903 -3

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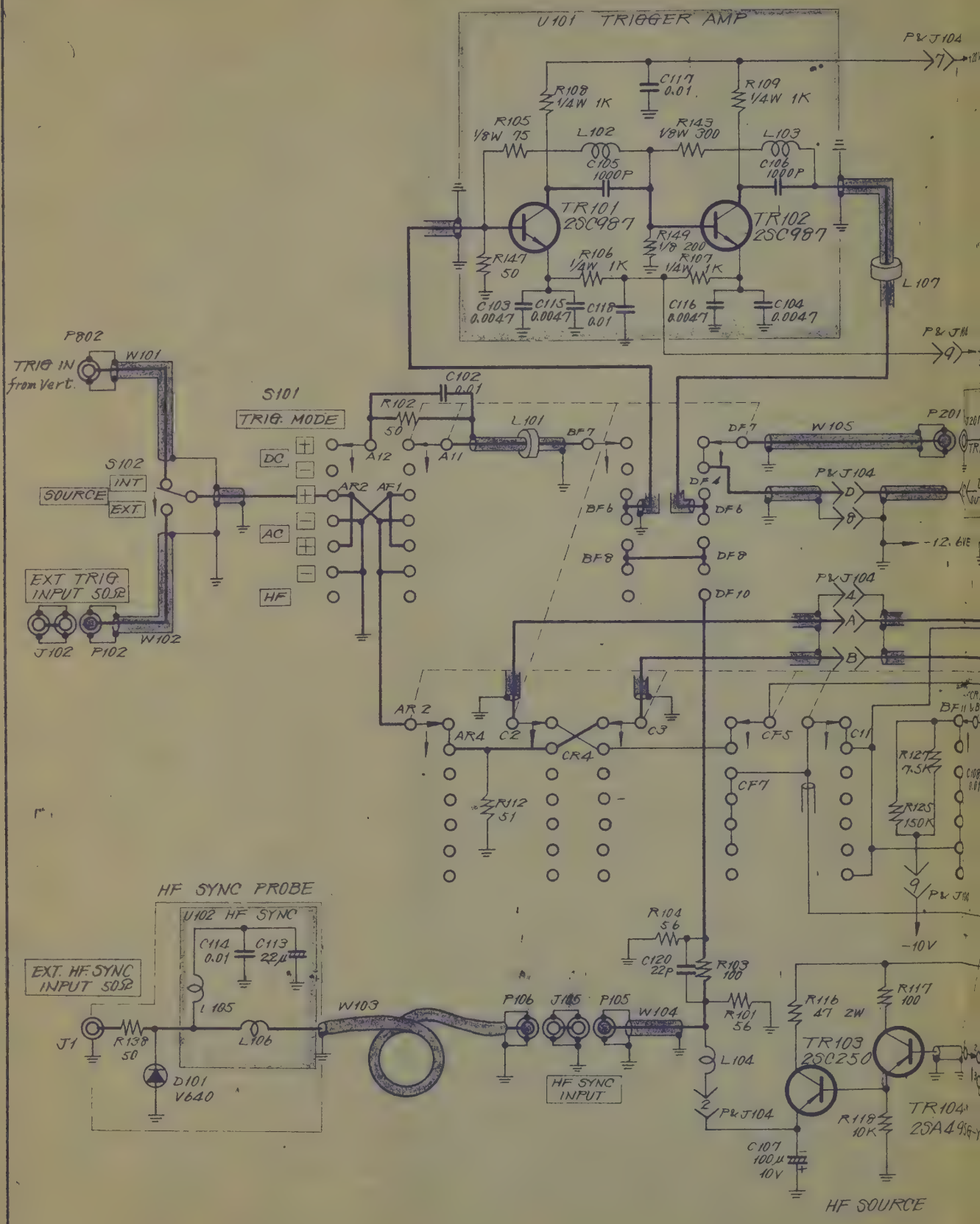
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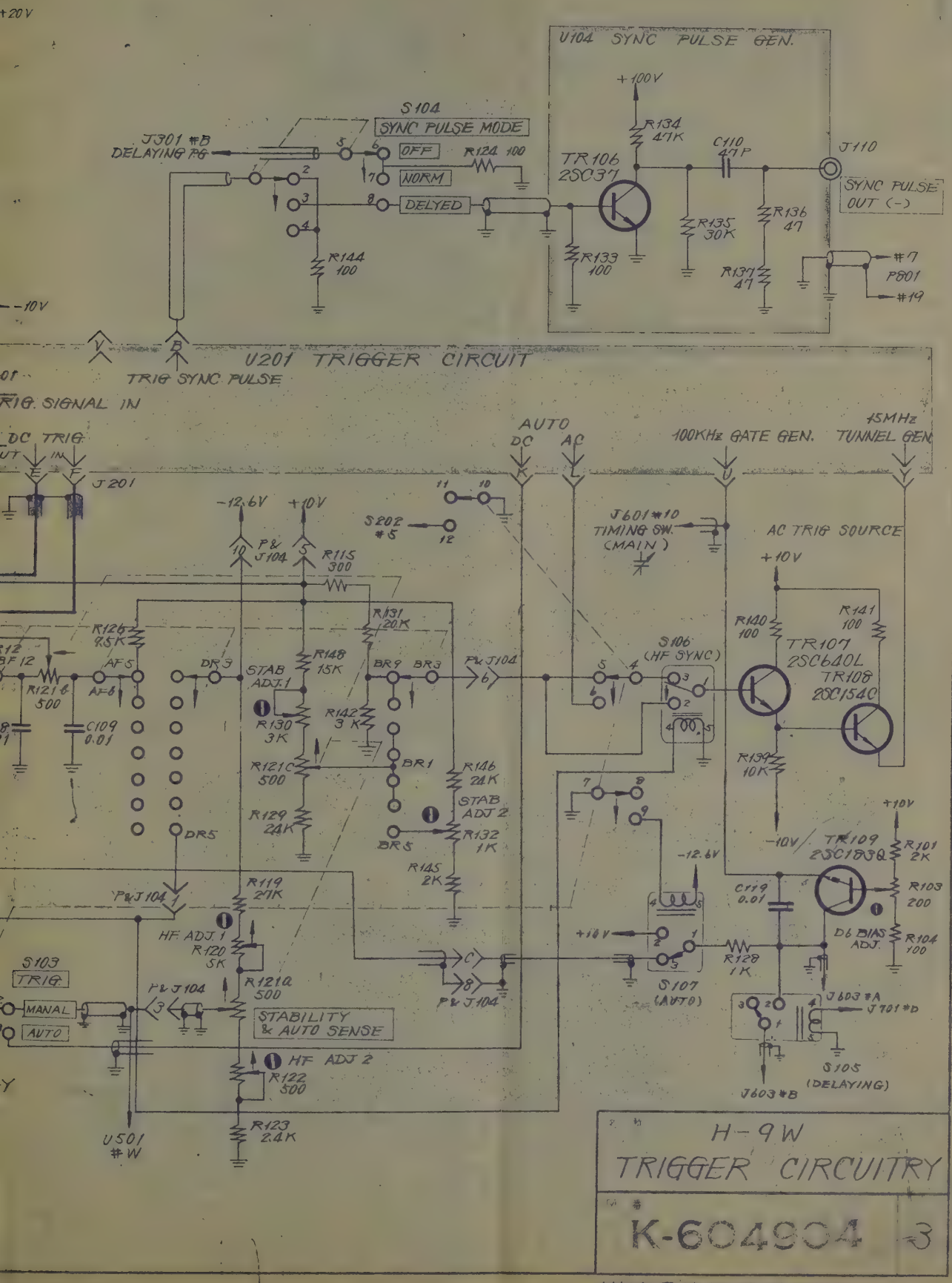
R108 1/4W 1K
C117 0.01
R109 1/4W 1K
R105 1/8W 75
L102
R143 1/8W 300
L103
C105 1000P
C106 1000P
TR101 2SC987
TR102 2SC987
R149 1/8 200
R147 50
R106 1/4W 1K
R107 1/4W 1K
L107
C103 0.0047
C115 0.0047
C118 0.01
C116 0.0047
C104 0.0047
P&J104
P802
TRIG IN from Vert.
W101
S101
TRIG. MODE
C102 0.01
R102 50
L101
BF7
DF7
W105
P201
DC
A12
A11
S102
SOURCE
INT
EXT
AR2
AF1
DF4
P&J104
BF6
DF6
AC
-12.6VE
BF8
DF8
EXT TRIG INPUT 50Ω
HF
DF10
P&J104
J102
P102
W102
AR2
AR4
C2
C3
CR4
CF5
C11
BF11
R127 7.5K
CF7
R112 51
R125 150K
HF SYNC PROBE
U102 HF SYNC
C114 0.01
C113 22μ
R104 56
-10V
EXT. HF SYNC INPUT 50Ω
L105
C120 22P
R103 100
R116 47 2W
R117 100
W103
P106
J105
P105
W104
R101 56
TR103 2SC250
J1
R138 50
L106
L104
TR104 2SA49
D101 V640
HF SYNC INPUT
P&J104
R118 10K
C107 100μ 10V
HF SOURCE



H-9W

TRIGGER CIRCUITRY

K-604904 3

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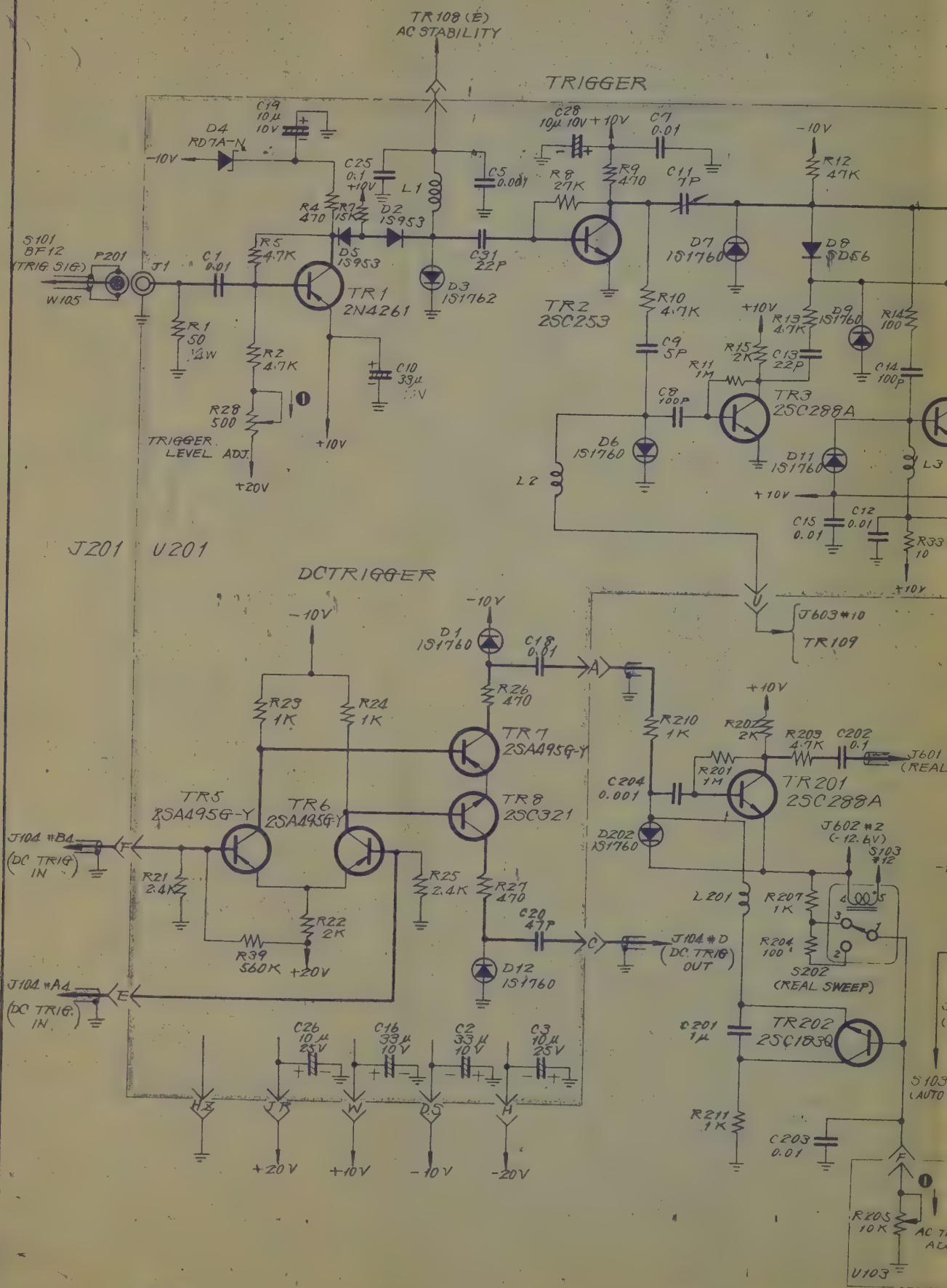
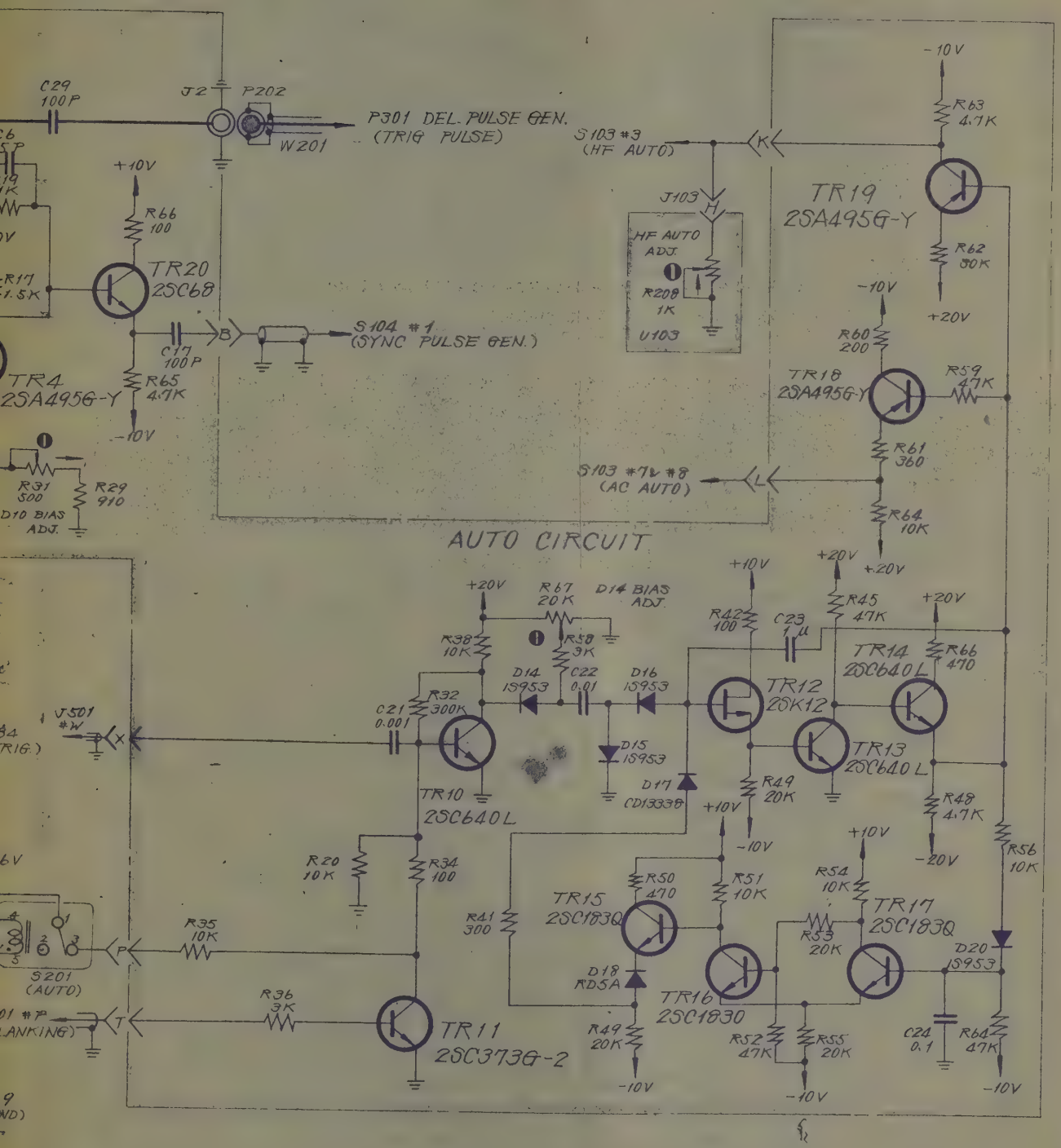
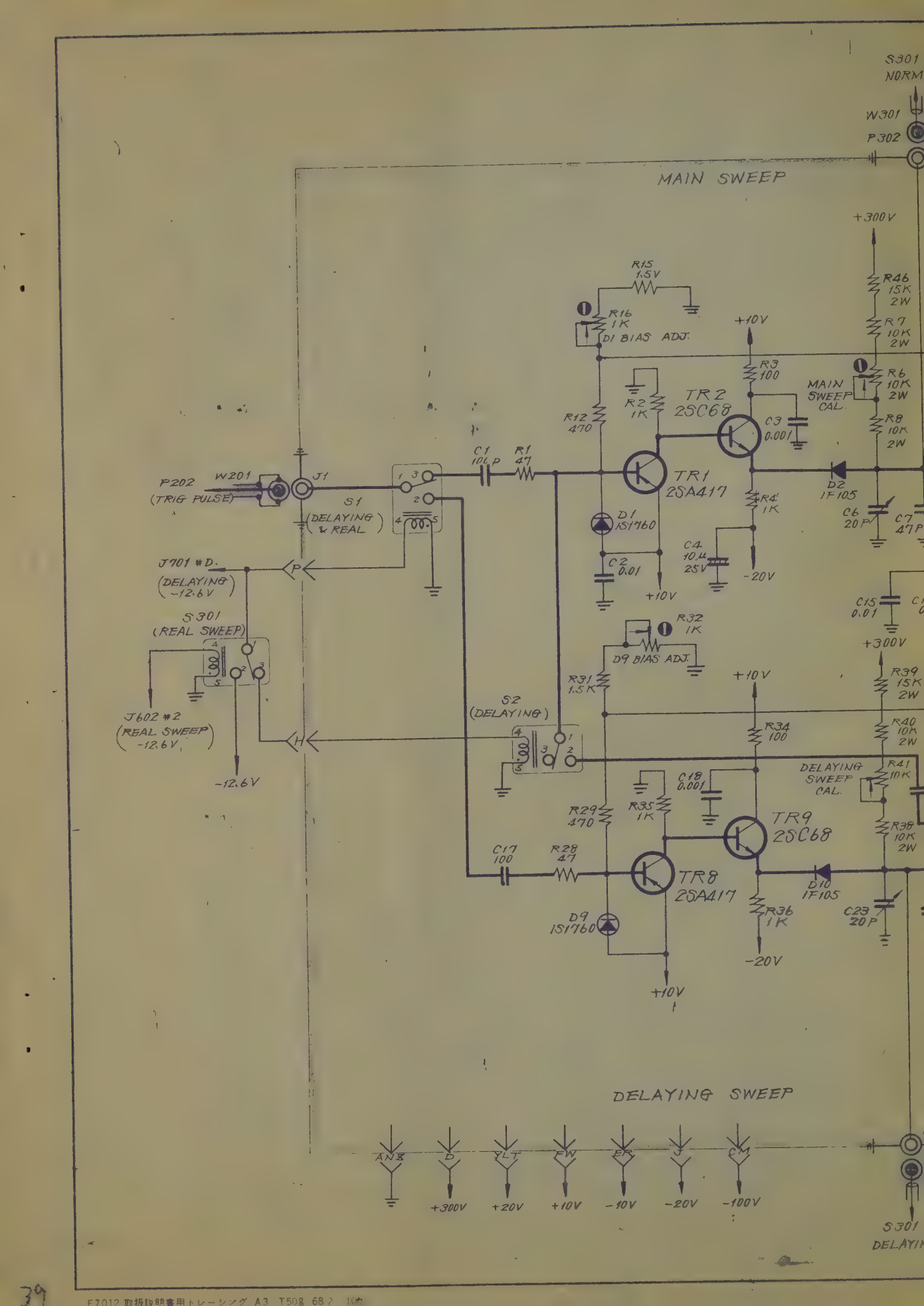
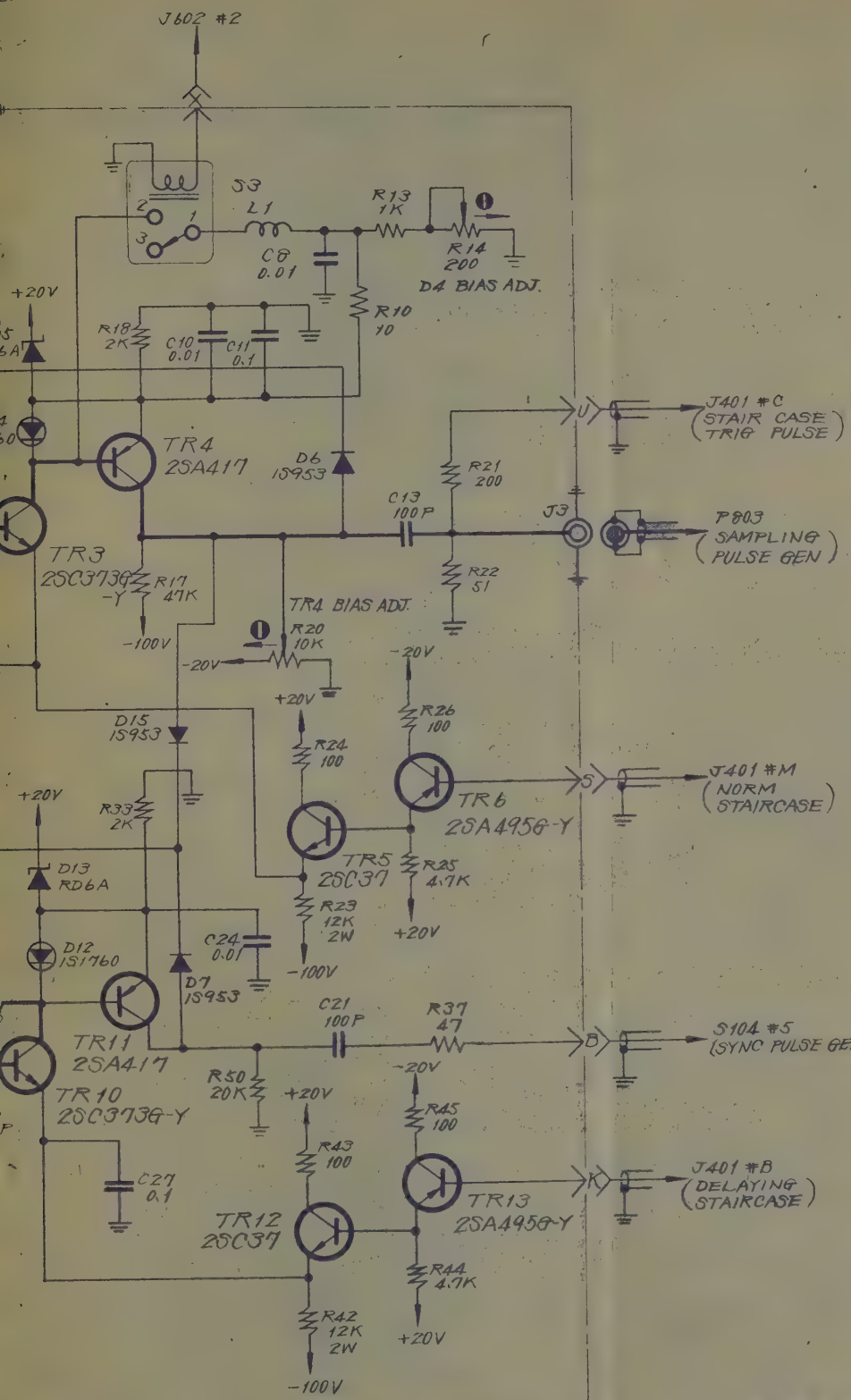

TR108 (E)
AC STABILITY
TRIGGER
D4
RD7A-N
C19
10μ
10V
-10V
C25
0.1
+10V
L1
C5
0.001
R4
470
R7
15K
D2
1S953
S101
BF12
(TRIG SIG)
P201
J1
C1
0.01
W105
R5
4.7K
D5
1S953
TR1
2N4261
D3
1S1762
C31
22P
R1
50
1/2W
R2
4.7K
C10
33μ
R28
500
TRIGGER
LEVEL ADJ.
+20V
+10V
C28
10μ 10V
+10V
C7
0.01
R8
27K
R9
470
C11
7P
TR2
2SC253
R10
4.7K
C9
5P
C8
100P
D6
1S1760
L2
D7
1S1760
-10V
R12
4.7K
D8
1S56
+10V
R13
4.7K
D9
1S1760
R14
100
R15
2K
C13
22P
R11
1M
C14
100P
TR3
2SC288A
D11
1S1760
L3
C15
0.01
C12
0.01
R33
10
+10V
J603*10
TR109
J201
U201
DCTRIGGER
-10V
D1
1S1760
C18
0.01
A
R23
1K
R24
1K
R26
470
TR7
2SA495G-Y
TR5
2SA495G-Y
TR6
2SA495G-Y
TR8
2SC321
J104*B4
(DC TRIG IN)
F
R21
2.4K
R22
2K
R39
560K
+20V
R25
2.4K
R27
470
C20
47P
C
J104*D
(DC TRIG OUT)
D12
1S1760
J104*A4
(DC TRIG. IN)
E
C26
10μ
25V
C16
33μ
10V
C2
33μ
10V
C3
10μ
25V
Z
R
W
D
H
+20V
+10V
-10V
-20V
+10V
R210
1K
R202
2K
R203
4.7K
C202
0.1
J601
(REAL
R201
1M
C204
0.001
TR201
2SC288A
D202
1S1760
J602*Z
(-12.6V)
S103
*12
L201
R207
1K
R204
100
S202
(REAL SWEEP)
C201
1μ
TR202
2SC1830
R211
1K
C203
0.01
S103
(AUTO
F
R205
10K
AC
AD
U103



名称	H-9W TRIGGER CIRCUIT
番号	K-604905 3



E7012 取扱説明書用トレーシング A3 T508 68.2 10色



H-9W

DELAYING PULESE GEN.

K-8[illegible]906 3

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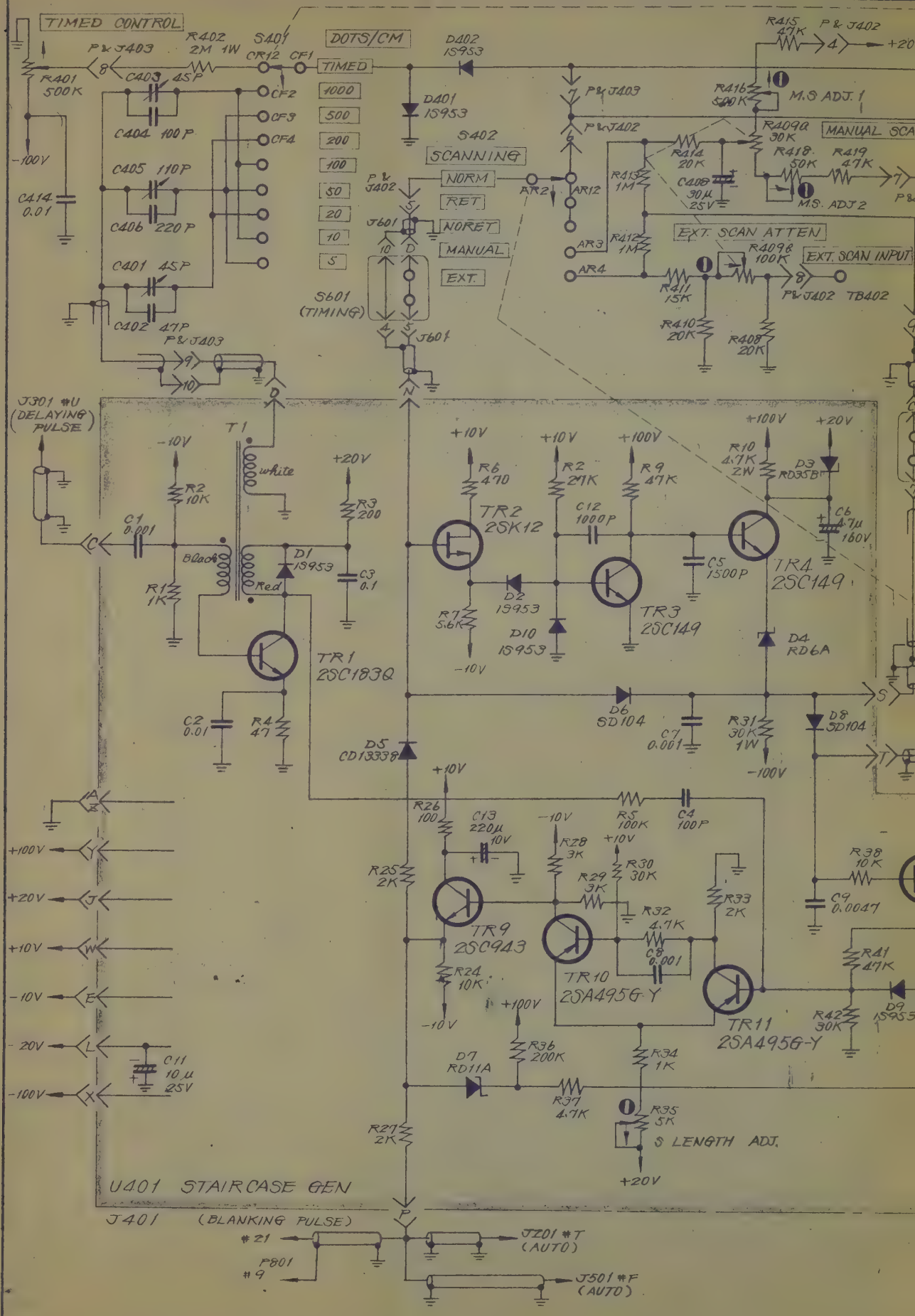
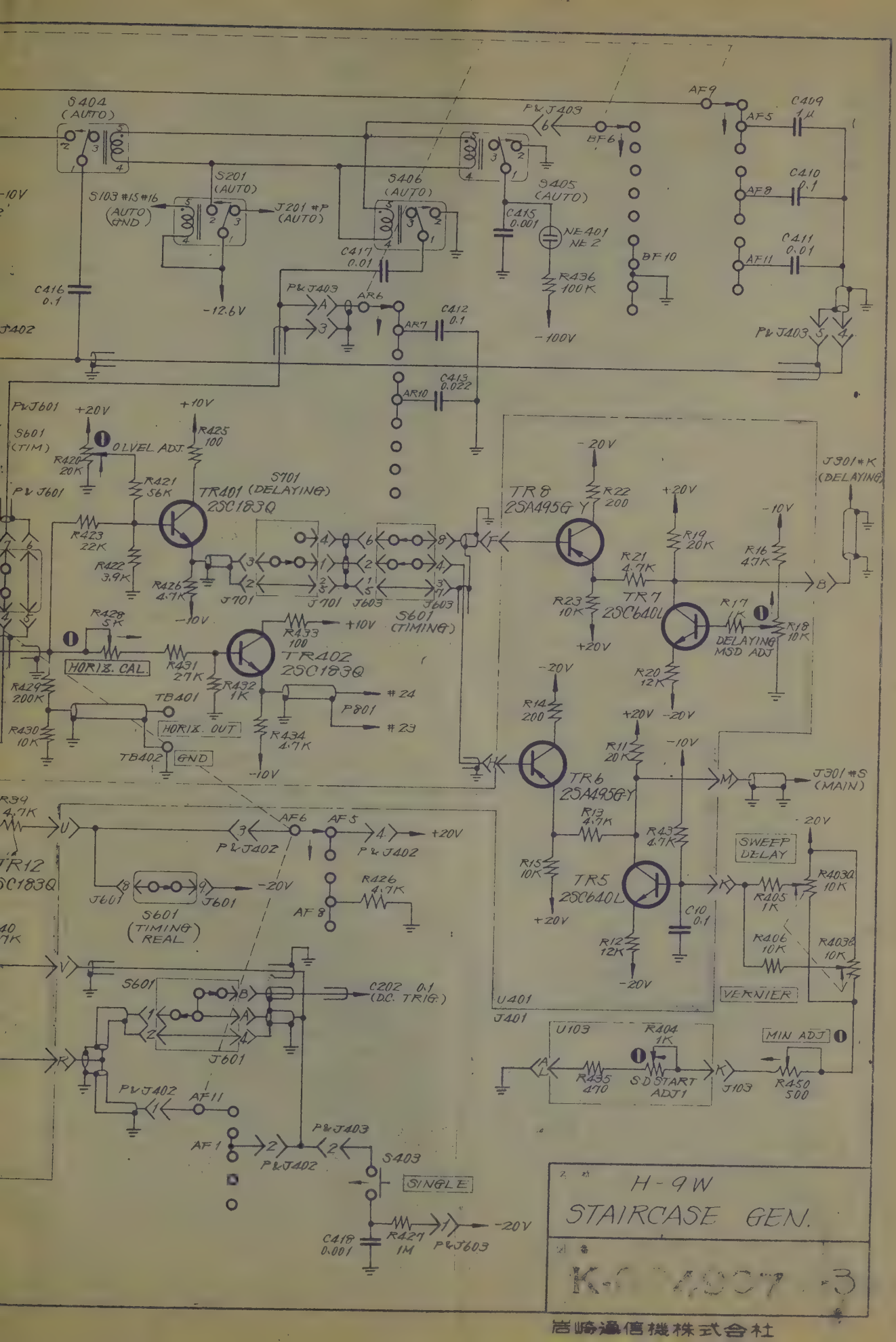


F7012 取扱説明書用トレーシング A3 T50g 68.2 1000


S404 (AUTO)
S201 (AUTO)
S103 #15 #16 (AUTO GND)
J201 #P (AUTO)
S406 (AUTO)
S405 (AUTO)
C415 0.001
NE401 NE2
R436 100K
-100V
C417 0.01
C416 0.1
-12.6V
J402
P&J403
AR6
AR7
C412 0.1
AR10
C413 0.022
AF9
AF5
C409 1μ
AF8
C410 0.1
AF11
C411 0.01
BF6
BF10
P&J403
P&J601
+20V
+10V
S601 (TIM)
OLVEL ADJ
R420 20K
R421 56K
R425 100
S701
TR401 (DELAYING) 2SC183Q
R423 22K
R422 3.9K
R426 4.7K
J701
J603
S601 (TIMING)
R428 5K
HORIZ. CAL.
R429 200K
R430 10K
R431 2.7K
R432 1K
R433 100
TR402 2SC183Q
TB401
TB402
HORIZ. OUT
GND
R434 4.7K
P801
#24
#23
-10V
TR8 2SA495G Y
R22 200
R19 20K
R21 4.7K
R23 10K
TR7 2SC640L
R16 4.7K
R17 1K
R18 10K
DELAYING MSD ADJ
R20 12K
J301 #K (DELAYING)
R14 200
R11 20K
TR6 2SA495G-Y
R13 4.7K
R43 4.7K
R15 10K
TR5 2SC640L
C10 0.1
R12 12K
J301 #S (MAIN)
SWEEP DELAY
R403Q 10K
R405 1K
R406 10K
R403R 10K
VERNIER
U401
J401
U103
R404 1K
S.D START ADJ
R435 470
J103
MIN ADJ
R450 500
R39 4.7K
TR12 2SC183Q
R40 4.7K
AF6
AF5
P&J402
J601
S601 (TIMING REAL)
R426 4.7K
AF8
C202 0.1 (DC. TRIG.)
AF11
AF1
S403
SINGLE
C418 0.001
R427 1M
H-9W
STAIRCASE GEN.
K-7007-3
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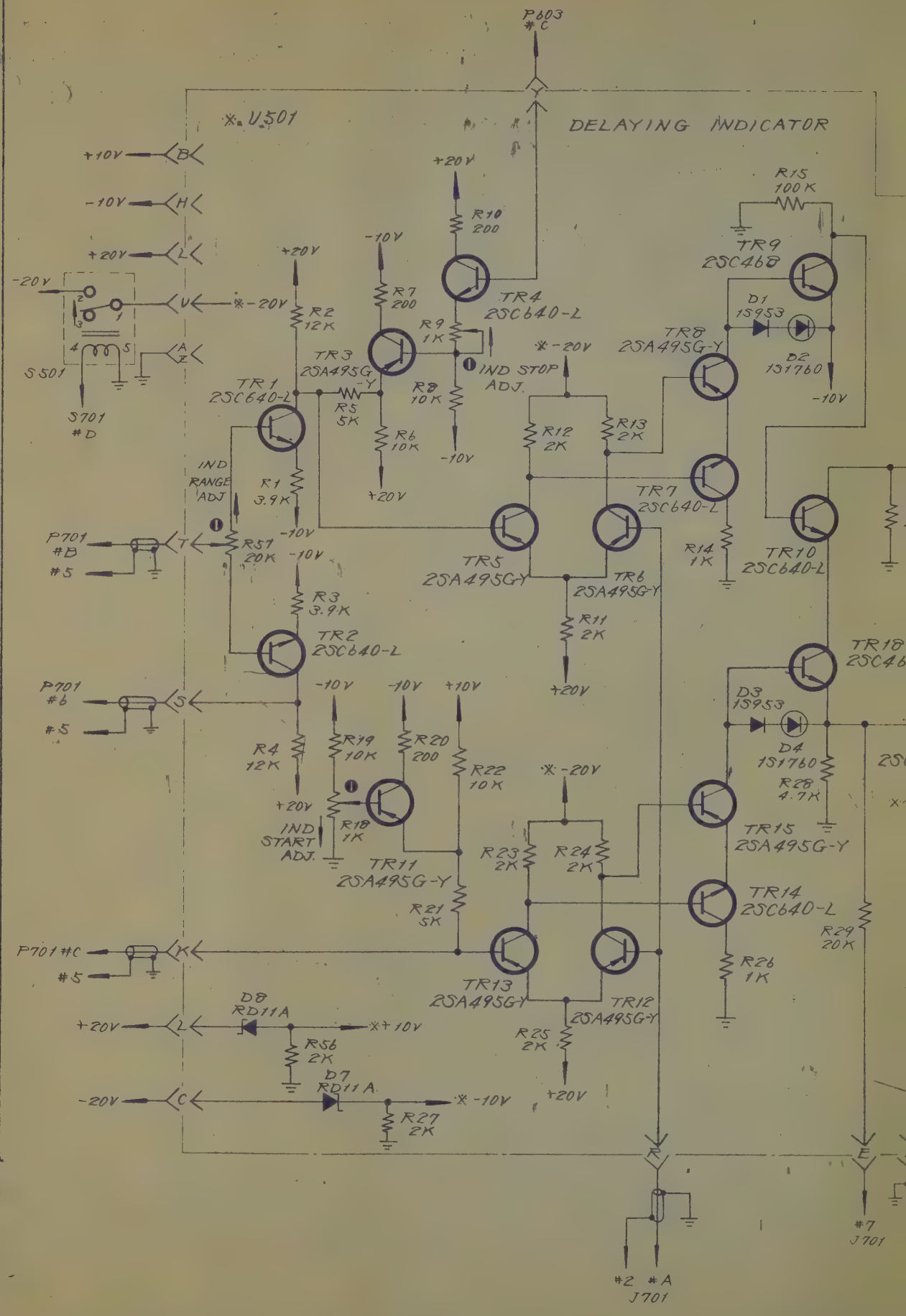
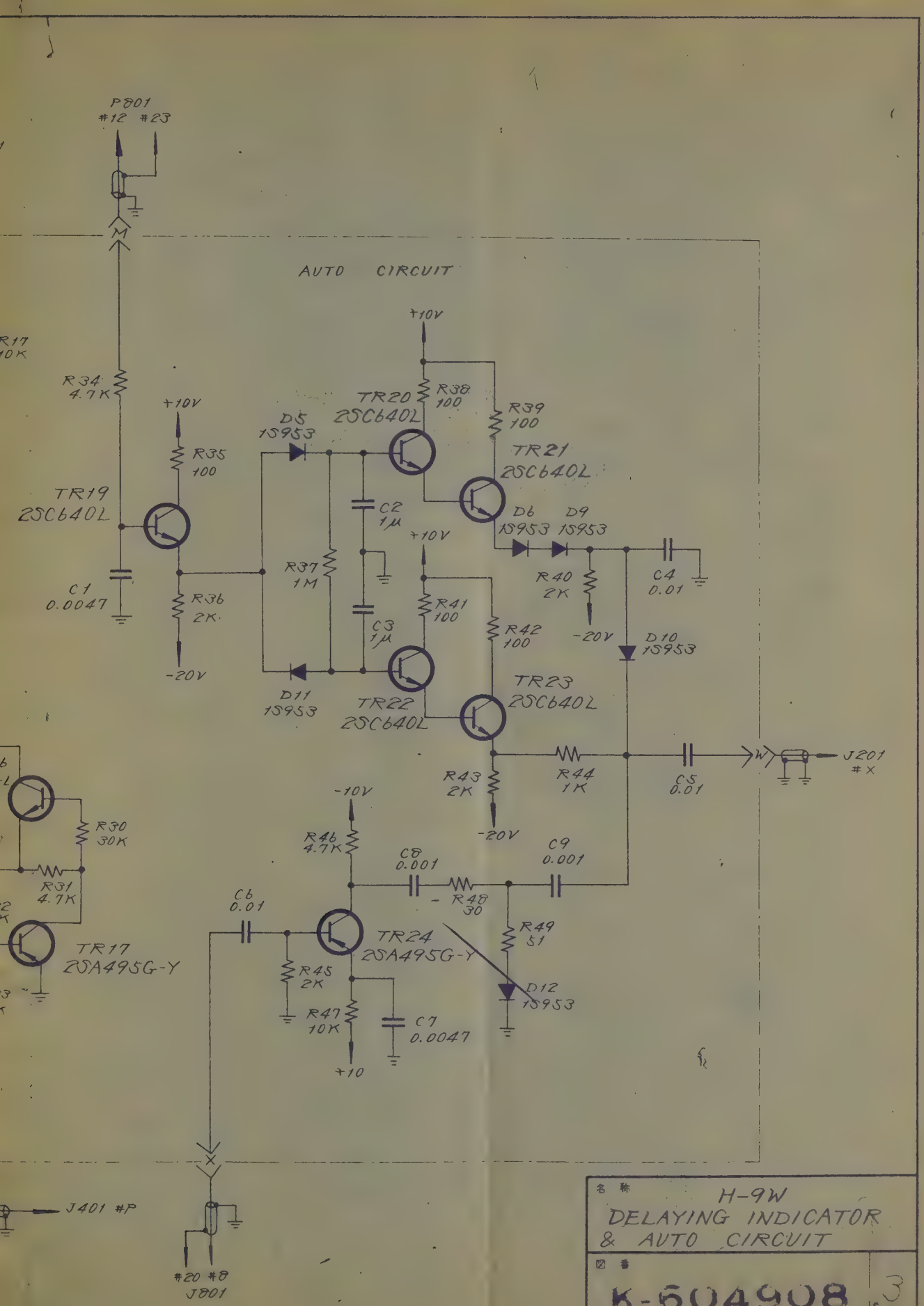

P603 #C
※U501
DELAYING INDICATOR
+10V
-10V
+20V
-20V
B
H
L
V
A
Z
S501
S701 #D
R1 3.9K
R2 12K
R3 3.9K
R4 12K
R5 5K
R6 10K
R7 200
R8 10K
R9 1K
R10 200
R11 2K
R12 2K
R13 2K
R14 1K
R15 100K
R18 1K
R19 10K
R20 200
R21 5K
R22 10K
R23 2K
R24 2K
R25 2K
R26 1K
R27 2K
R28 4.7K
R29 20K
R56 2K
R57 20K
TR1 2SC640-L
TR2 2SC640-L
TR3 2SA495G-Y
TR4 2SC640-L
TR5 2SA495G-Y
TR6 2SA495G-Y
TR7 2SC640-L
TR8 2SA495G-Y
TR9 2SC468
TR10 2SC640-L
TR11 2SA495G-Y
TR12 2SA495G-Y
TR13 2SA495G-Y
TR14 2SC640-L
TR15 2SA495G-Y
TR18 2SC46
D1 1S953
D2 1S1760
D3 1S953
D4 1S1760
D7 RD11A
D8 RD11A
IND RANGE ADJ
IND STOP ADJ.
IND START ADJ.
P701 #B
#5
P701 #b
#5
P701 #C
#5
#7 J701
#2 #A J701
R
E
F7012 取扱説明書用トレーシング A3 T50g 69 6 1000



名称	H-9W DELAYING INDICATOR & AUTO CIRCUIT
図番	K-604908 .3

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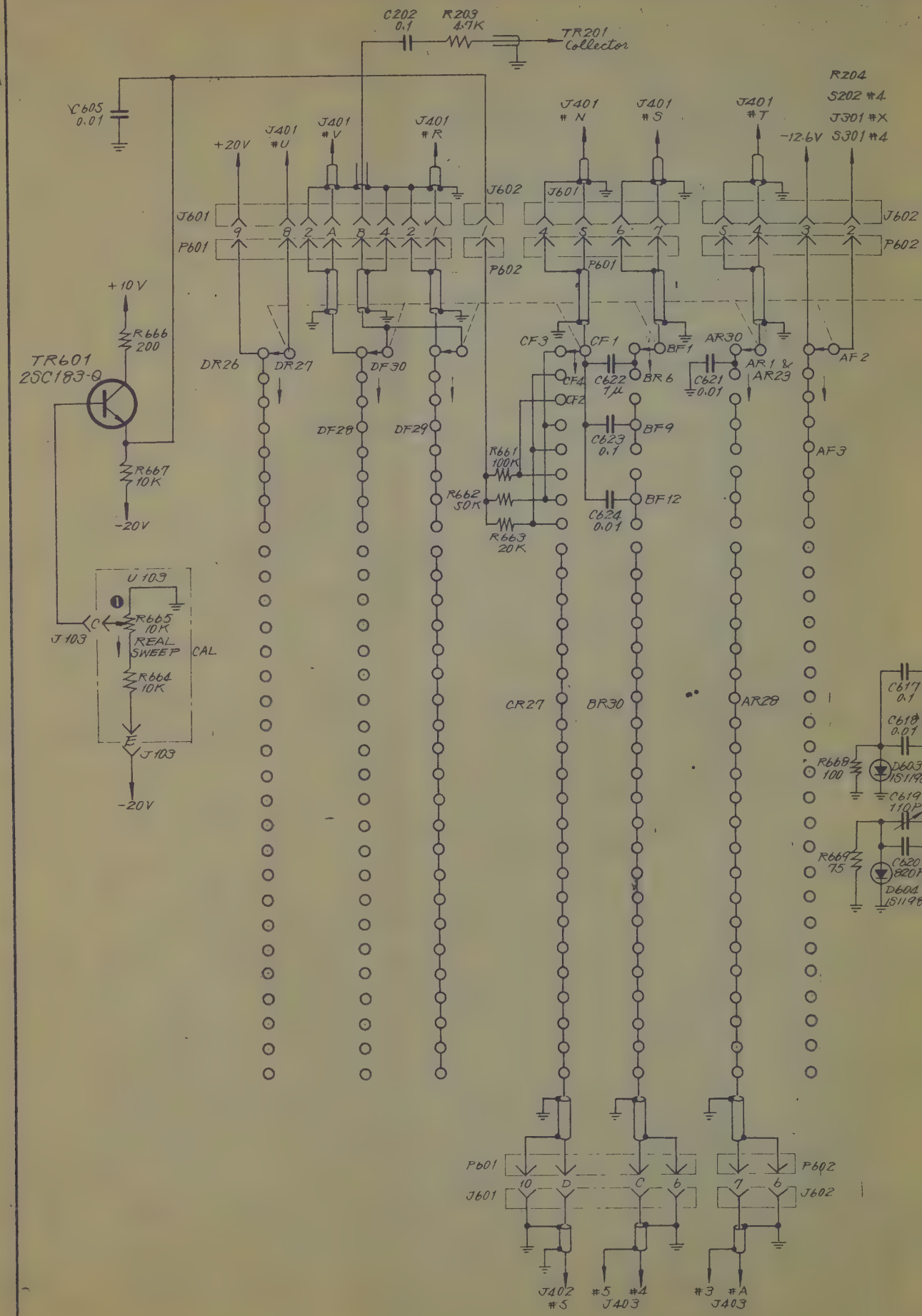
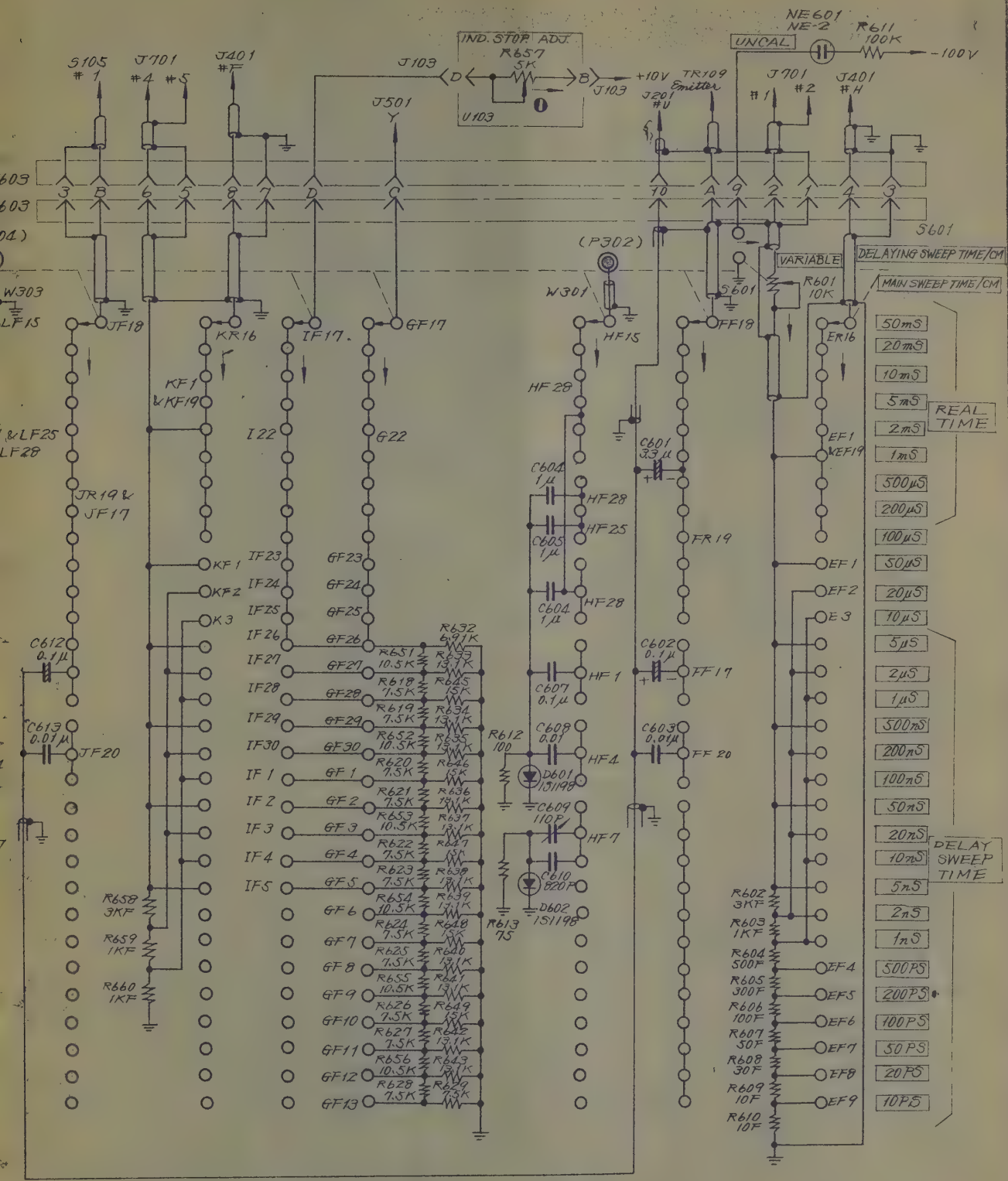


F7012 取扱説明書用トレーシング A3 T508 68.2 1000



H-9W

TIMING SWITCH CIRCUIT

図番 K-604909 3

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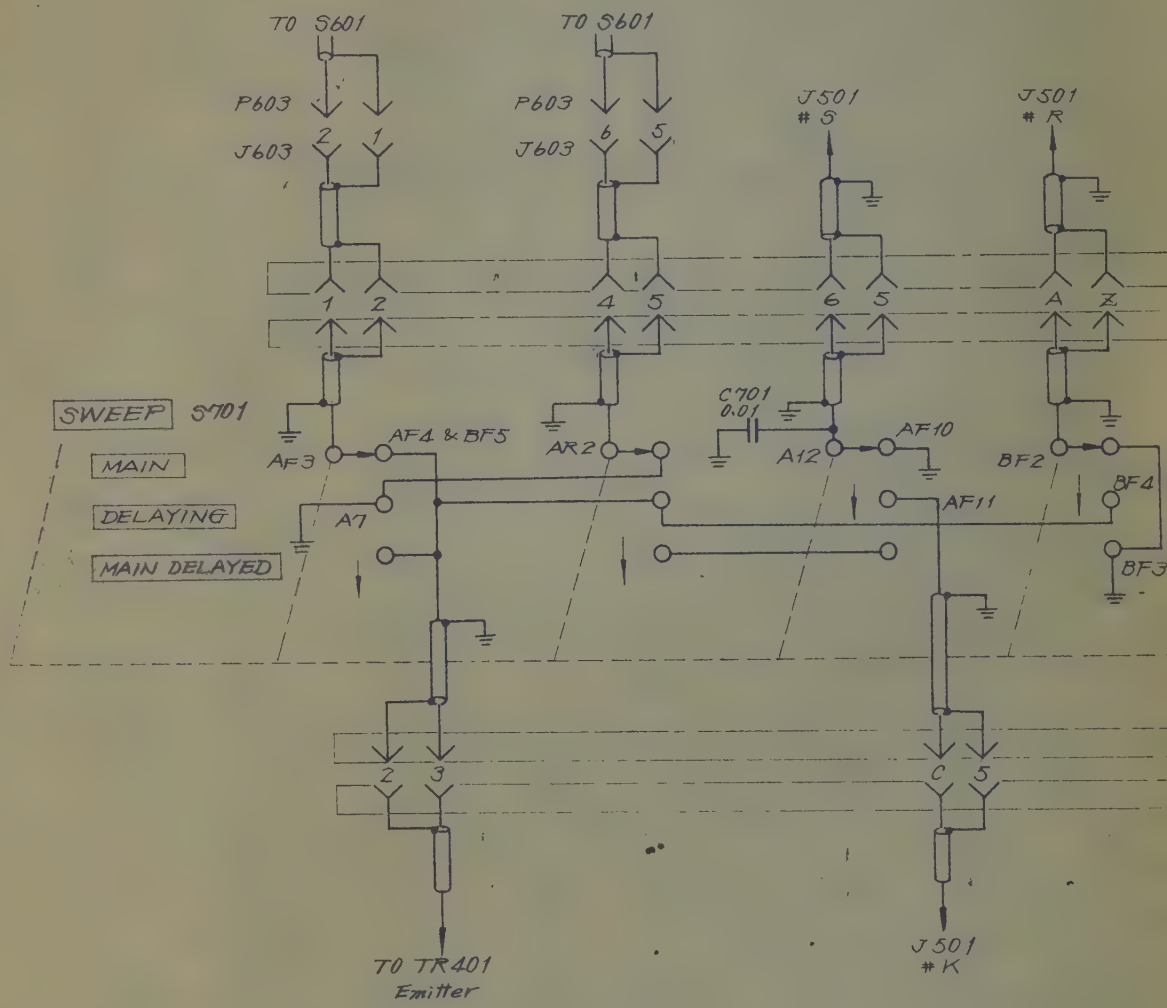
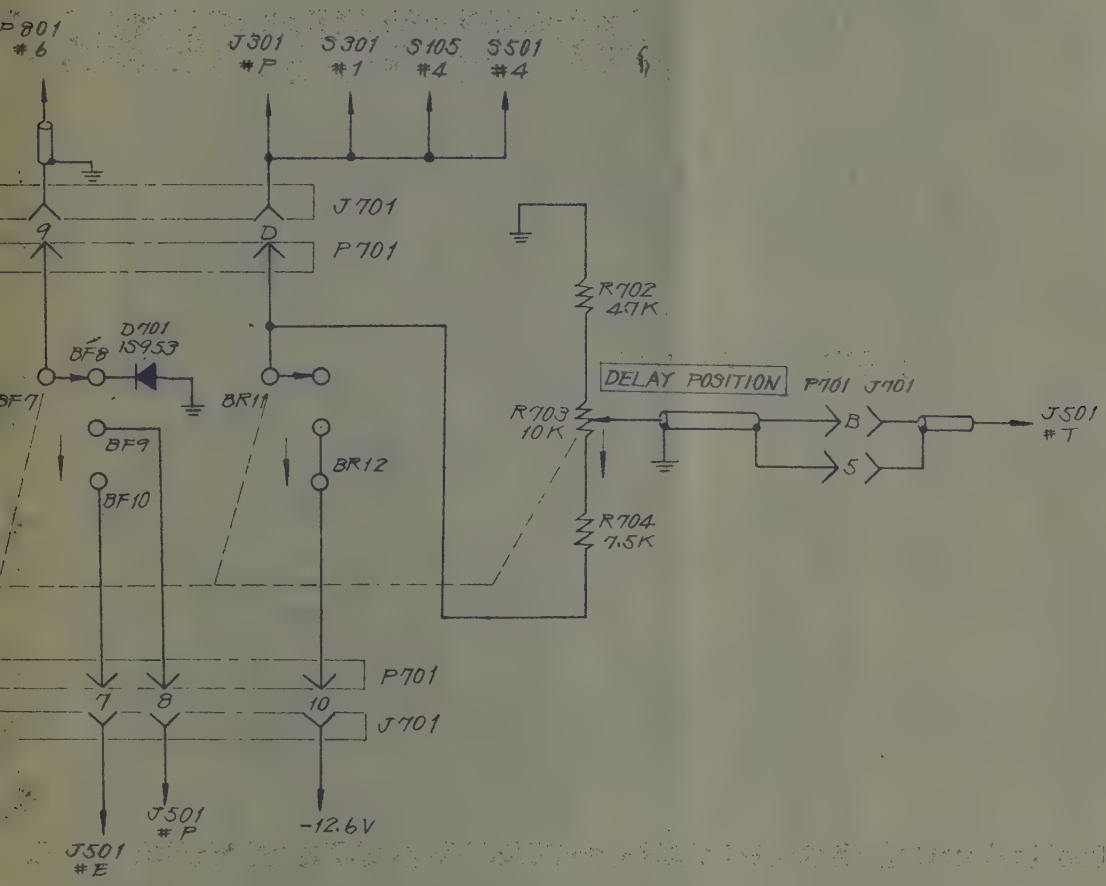

TO S601
TO S601
P603
J603
P603
J603
J501 # S
J501 # R
SWEEP S701
MAIN
DELAYING
MAIN DELAYED
AF3
AF4 & BF5
AR2
C701 0.01
A12
AF10
BF2
BF4
BF3
A7
AF11
TO TR401 Emitter
J501 # K



H-9W

DELAYING SWITCH CIRCUIT

K-604910 3

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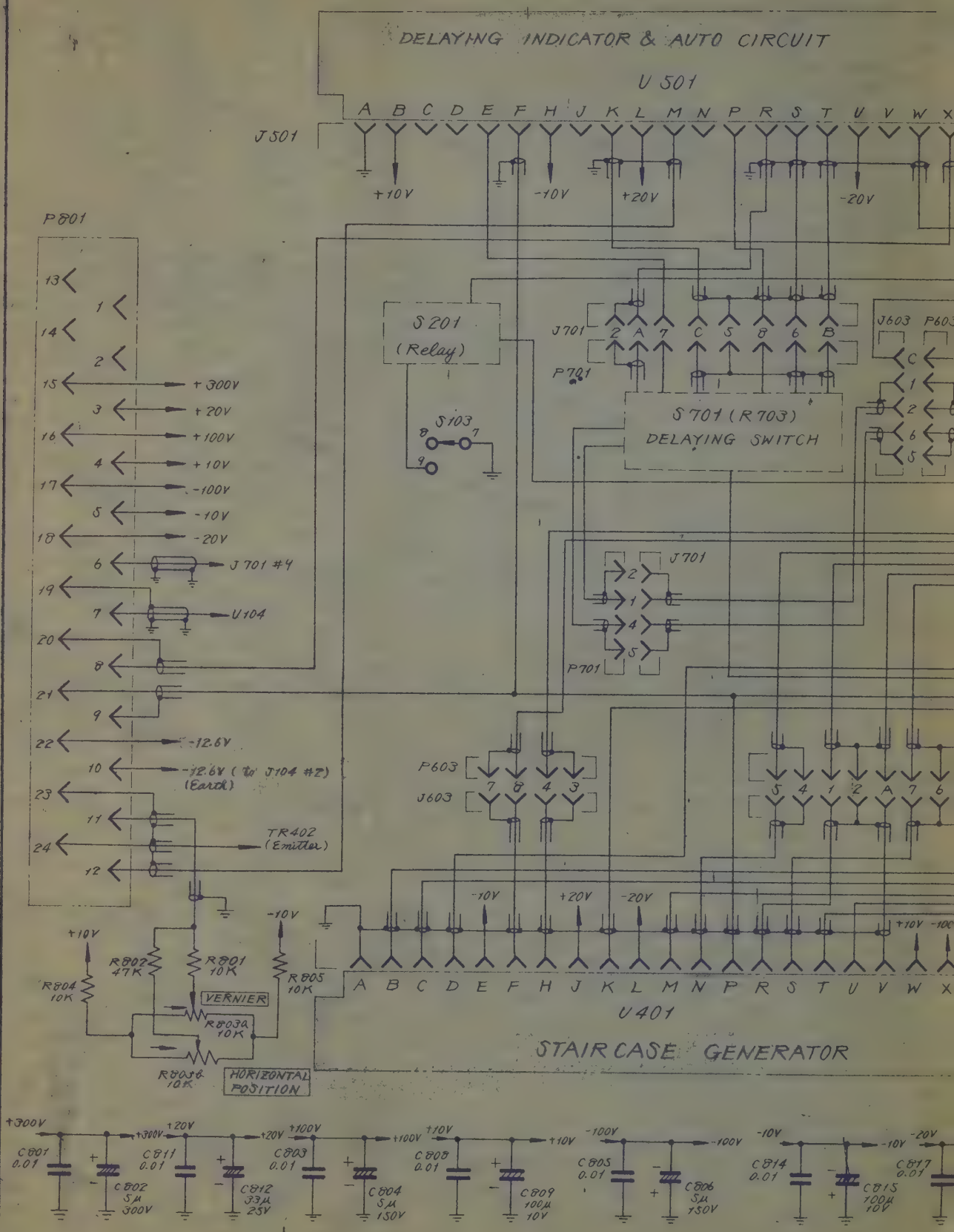
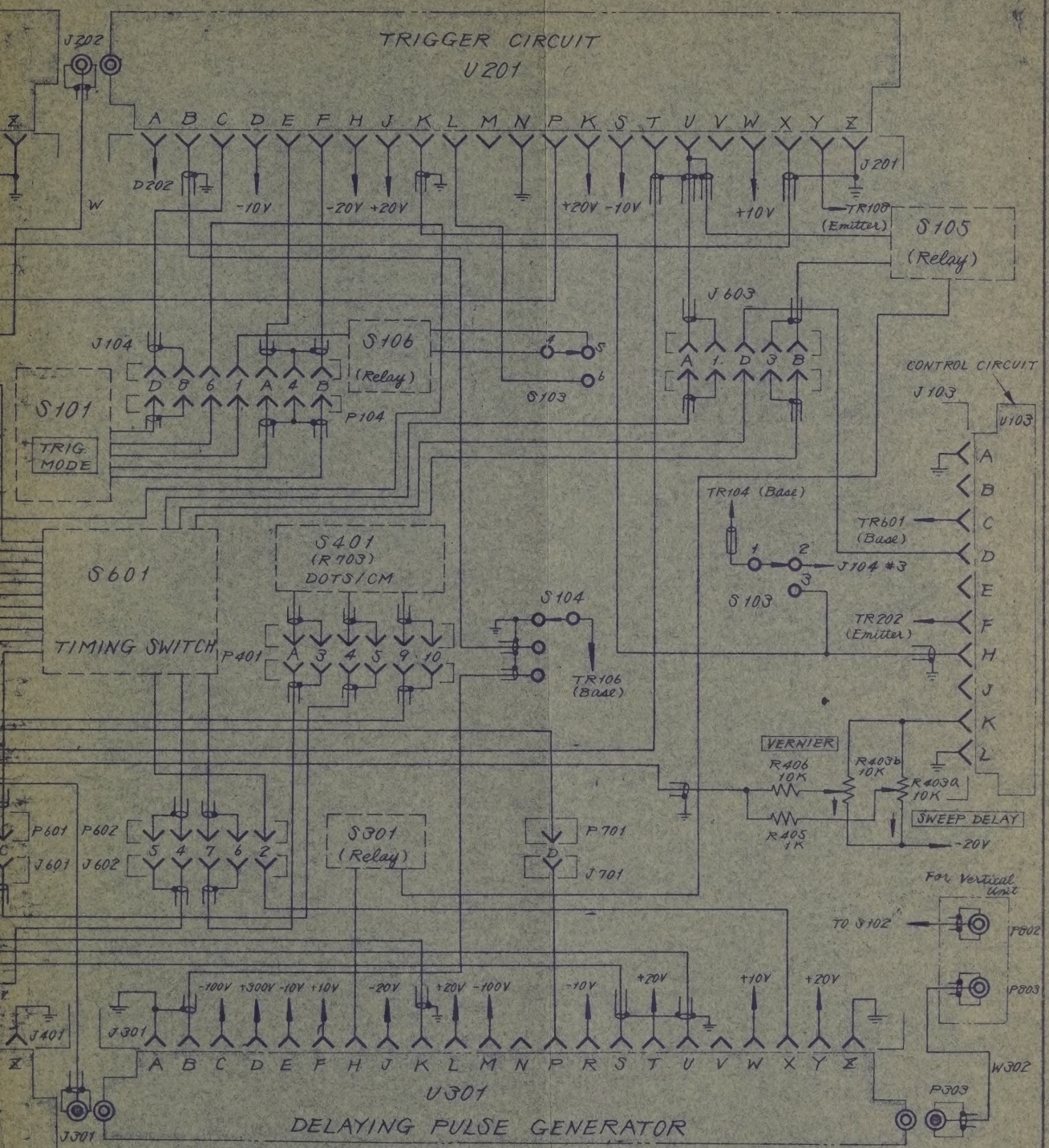

DELAYING INDICATOR & AUTO CIRCUIT
U 501
J 501
A B C D E F H J K L M N P R S T U V W X
+10V
-10V
+20V
-20V
P801
13
1
14
2
15
+300V
3
+20V
16
+100V
4
+10V
17
-100V
5
-10V
18
-20V
6
J 701 #4
19
7
U104
20
8
21
9
22
-12.6V
10
-12.6V (to J104 #2)
(Earth)
23
11
24
TR402
(Emitter)
12
S 201
(Relay)
S103
8
7
9
J701
2 A 7 C 5 8 6 B
P701
S 701 (R703)
DELAYING SWITCH
J603 P603
C 1 2 6 5
J701
2 1 4 5
P701
P603
J603
7 8 4 3
5 4 1 2 A 7 6
-10V
+20V
-20V
+10V -100
R802
47K
R801
10K
R804
10K
R805
10K
VERNIER
R803a
10K
R803b
10K
HORIZONTAL
POSITION
A B C D E F H J K L M N P R S T U V W X
U401
STAIR CASE GENERATOR
+300V
+20V
+100V
+10V
-100V
-10V
-20V
C801 0.01
C802 5μ 300V
C811 0.01
C812 33μ 25V
C803 0.01
C804 5μ 150V
C808 0.01
C809 100μ 10V
C805 0.01
C806 5μ 150V
C814 0.01
C815 100μ 10V
C817 0.01



名称 H-9W INTER CONNECTING

図番 K-604911 3

吉崎通信機株式会社

岩崎通信機株式会社
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NIHONBASHI-TORI, CHUO-KU, TOKYO, 103 JAPAN PHONE: TOKYO 272—0461
CABLE ADDRESS: TELEPHIWTSU TELEX: TK 4225 TELEIWA

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■**計 測 器**　シンクロスコープ・サンプロスコープ・パルス発生器・デジタル測定器・トランジスタ測定器・システム計測・スイッチ

■**ファクス**　電子複写機・電子複写製版機・電子写真マイクロフィルム機器

■**情報機器**　データ通信端末機器・データック・ドラフタック・デジタルプロッタ・データディスプレイ

MP MASTER
MA33662